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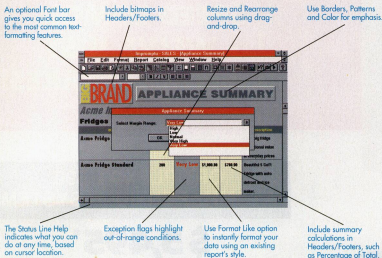
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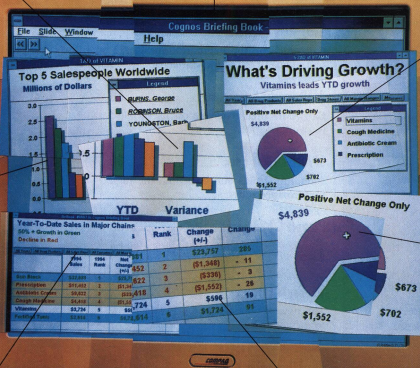
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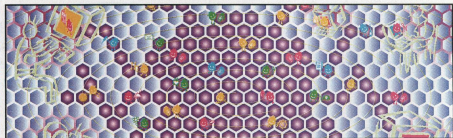
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The Dominance Domino theory



Senior VPs worldwide cough and look aggrieved when the D word is applied to their companies. Not because their feelings are hurt, but because when you're the dominant Goliath, everyone else wants to play a gallant David, often in teams and with the perceptual backing of media and market.

Intel and Microsoft dominate the PC market. Everyone buys their products, but no one has a good word for the dear old things. Intel's just churning out those late-1960s model braindead-enhanced CISC CPUs. Microsoft is purveyor of "that kludge of an operating environment running over that dog of an operating system". I suspect Intel's Andy Grove isn't too worried by this, and Bill Gates has got so cocky he's naming his products after his net wealth (and you thought Windows95 referred to the release year, not his extremely rich and way-cool \$US9.5 billion net worth).

Dominance is a little like a market inbreeding though; it encourages diversification. Fact is, the products produced by each have been, if not always the best technologies, then at least holistically the best products to market. For other companies to compete they have to innovate and cooperate. Dominance, in a perverse sort of way, is good for competition.

As you read through this issue, you'll see myriad examples of this.

While Windows95 (I must stop using that Chicago word) occupies obvious mind-space as the only operating system upgrade most of us are likely to make in the near future, IBM's OS/2 Warp is functionally appealing, will include Internet access out of the box, is packed with added-value and offers a powerful environment for personal computing. And the company has gone into hype overkill pushing it.

PowerPC is constantly gaining momentum, as you'll see in Newsprint, with companies like Toshiba joining the chipwagon and Motorola releasing its own PowerStack line. We also drop-ear on rumours that Apple is a likely takeover target for IBM, Motorola or AT&T, and consider some of the births from the IBM-Apple affair. Check out too our detailed analysis of the hot PowerPC 620 in our New CPUs feature.

Intel is also under some pressure from reports that Compaq, the world's current number one PC vendor, is considering the Pentium class M1 chip from Cyrix. Compaq has already done much to endorse competition in the CPU market by adopting processors from AMD, and we check out AMD's own fifth generation offering in our CPU feature, along with powerhouses from Mips and Sun.

Intel has its own momentum. New notebooks are appearing from Texas Instruments, Toshiba, NEC, IBM and others based on Intel's 75MHz lower power consumption 3.3V Pentium, and while we haven't been able to get our greedy mitts on them yet, we're trying hard.

On a more melancholy note, *APC* farewelled its editor of nearly two and a half years, Maryanne Phillips, with the October issue. The appeal of yachting with smoked salmon and capers on sundrenched stretches of tranquil harbour and the time to write, for some bizarre reason, has tempted her away from us. Maryanne guided the magazine through and out of a difficult stretch of waters to entrench *APC* even more firmly as Australia's (dare I say it) dominant computing magazine, and she deserves some clear sailing.

A stylized, handwritten signature in black ink, consisting of a large, sweeping 'J' followed by a series of loops and a final flourish.

Jeremy White
Editor (Acting)

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I-way mirage

A Gore started it — the information highway was his metaphor for global access to large volumes of information, his election platform, and most importantly, his vision. Since Gore, any politician worthy of the title has been seized by the urge to acquire a vision for ubiquitous information access, even those from far flung islands in the South Pacific.

Prime Minister Paul Keating and Federal Opposition Leader Alexander Downer have both made reference to the information superhighway in out-looks of their parties' strategies for the latter half of the decade. Business, education, entertainment and myriad information sources will benefit from advances

in information technology, say both parties, and both affirm that they are ahead of the field in policies which will capitalise on this benefit.

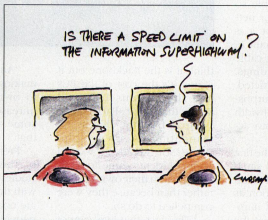
Speaking at the Labor Party conference in Tasmania in September Mr Keating likened

telegraphic services a century ago. These were, he said, elements which gave a material dimension to the national sentiment. Using the well worn analogy of the parent who knows what a VCR does and the child who can actually pro-

gram one, Mr Keating conceded that neither his government nor the industry at large could predict the exact course of the implementation of the superhighway, but recognised that it was a "moment in our history where how well we play the information game will determine how well we prosper." The danger, he said, was in becoming obsessed with the

medium itself; while building the highway is critical, crafting what goes on it is more impor-

Continued on page 12



the challenges posed by the information highway to the changes wrought by the spread of railways and

The university connection

A proposal in the US to mandate ownership of a PC and in some cases an Internet address as preconditions to university entrance have caused a furore among educators and students.

On one hand, it seems a logical progression as PCs, and the access to information which they afford, can be seen as integral to the education process. Tom Butte, director of computer and telecommunications at Humboldt State University has classified computers in the 1990s as being of equal importance as a slide rule in the 1970s. He told the *Los Angeles Daily Newspaper* that students needed to have a PC to obtain a good education.

According to Associated Press writer Elizabeth Weise, at Massachusetts Institute of Technology, new students are

given email accounts from their first day, and rooms are assigned across the email system, with an administrator informing new students of their number and details of their roommate. Correspondence with tutors about courses and essay extensions on email rather than in person is encouraged, and both students and teachers are finding it's an efficient way to work. Two thirds of Stanford University's dormitories on campus have their own Internet connections and the school estimates that it will have the whole campus wired by 1996.

On the other hand the question of cost as an impediment to access to education is a huge issue. With tutoring fees and associated expenses at California State University already costing an average \$US9140 a year, the added cost of up to

\$US3000 for PC and online facilities is seen as being inequitable and untenable. Vice president Al Gore released a statement on September 16 vowing that minorities (particularly blacks and women) would not be left "beside the road" while the wealthy zoomed off on the information superhighway. Equitable access is a priority for the government, and detractors of the mandatory technology in universities proposal say that it will deny access to education for large sections of the population.

In Australia, where universities are not generally privately owned and fee-funded, it is a very different story. Professor Don McNicol, vice chancellor of Sydney University and chair of the AV-CC commented: "If we tried to compel students to

Continued on page 10

News roundup

- Microsoft has decided. Its next version of Windows is going to be called Windows95. Well, "good luck" is all I can say.

Microsoft has never been good at names... but Windows95? Unfortunately I and everyone else who writes about computers in Australia is going to have to live with it. It is such a loser name. What was wrong with Windows 4.0?

It is a bit like MS-DOS 6. There was no 6.0 just 6. And then what happened? Well there were quite a few 6.x versions.

Somebody at Microsoft should hire somebody who knows about naming products. It's not hard. Lotus has got it licked. WordPerfect had a few minor problems with its PerfectOffice/Symmetry GroupWise product but that is all. Borland has managed well. Aldus can do it and so can just about everyone else.

I hear that not everyone in Microsoft's local organisation was impressed with the name. They were perhaps more impressed that Daniel Petre is now heading up the Advanced Technology Group at Microsoft from Australia. This is something of a feather in Mr Petre's hat as he is the only person outside the US to have such a key role.

- While Microsoft was making a mess of naming its new operating system product, Apple is still mucking about organising the licensing of its operating system. It is hard to understand why.

- Motorola has just launched a set of workstations based on the PowerPC architecture. They will run IBM's AIX and Windows NT but there is no word of a Macintosh OS for them. Seems a bit of a missed opportunity to me. (See 'Rumour bites into the big Apple' story on page 14.)

- I'm not sure about IBM's naming practices but at least Warp sounds reasonable. The blue giant is busy hyping up OS/2 Warp Version 3.0 which it hopes will do a lot better against Windows.

Warp is at least here now, while Windows95 won't be released until, well... 95. At over \$100 Warp may be too expensive but with Internet connections and the ability to run Windows, DOS and OS/2 applications it does look attractive.

IBM has meanwhile decided to delay its own PowerPC based offerings until next year. It seems that operating systems are behind the delay. The only

News roundup

OS not still in beta is AIX.

● The corporate tango was illustrated by Wang, Bull and Osborne. PC maker Osborne has decided to manage its growth by splitting into five companies. Each company will work as a unit covering an area of Osborne's operations.

Wang and Bull have gone the other way. They have amalgamated their Australian operations. There is some sense in this as both have different strengths in the services business.

● What is harder to understand is what is going on in the rest of the world. There is certainly a merging of the two companies, but it is patchy with some bits flowing together and other bits staying apart. A few months should see most of it sorted out.

● Colour lasers made it into the news with both Xerox and Hewlett-Packard putting out machines at around \$15,000. This is expensive but it is affordable for large installations where a single printer can be shared on a large network. It certainly makes preparing a presentation much easier.

● Services giant EDS won the \$750 million SA outsourcing deal and then promptly sponsored the Adelaide Grand Prix. This will mean a much larger EDS presence in Australia.

Also on the services front, IBM and Lend Lease got together to create ISSC. ISSC will specialise in large scale services work. It combines IBM's technical strengths with Lend Lease's skill in client relations and project and systems management.

Jeremy Horey

University connection from page 9

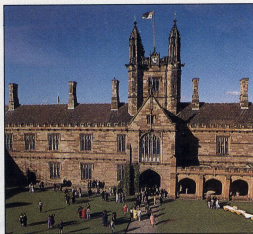
buy a PC by restricting access in this way, it is my belief that we would be breaking the law."

"We are some way from the prospect of ubiquitous access to online services, such as AARNet, but my hope is that we would get to that stage before too much longer. Already the University is in the middle of a multimillion dollar project upgrading our cable, so that we can improve our network infrastructure, but it is proving incredibly difficult in some instances to get the cable into some of the buildings. When they were constructed, nearly 100 years ago, surprisingly enough, high bandwidth cabling wasn't taken into account."

Staff, he says, will be the first rank of users. The ideal situation would be to give staff members an IP address as soon as they are given a payroll number, but he concedes that the actual speed of granting access is probably more in line with the AARNet's incremental ability to cope with more traffic.

"The prospect of dumping 30,000 more students on it in one go would certainly chew up the bandwidth—it is questionable whether it would survive."

The real problem, says Professor McNicol, is in the infrastructure. "Most people



Professor Don McNicol: "If we tried to compel students to buy a PC, it is my belief that we would be breaking the law"

think it is the backbone but it is not; it's the cost of the PCs and the campus LAN and WANs that join it all together."

Apart from the illegality of mandating PC ownership, Professor McNicol would prefer students came to technology from their own volition rather than because they were compelled to do so.

"The fact that we cannot compel is protection in that sense, but on the other hand the fact is that we should be encouraging it to happen; that we should be building the infrastructure within the university to make ownership an attractive and worthwhile proposition. Certainly some of our teaching would have to change to have made that investment on the part of students worthwhile."

"And while we should be making it easier for students to own computers, it is not unreasonable for them to bear some of the cost of doing that."

Professor John Mack, chair of the academic board of studies at the university concurs with this sentiment. "While we are not in a position to require people across the board to buy a PC before they can enter the university, it seems appropriate that a PC, like any other set of tools for a profession, should become a prerequisite. It is hard to imagine an accounting course which did not require familiarity with the top accounting software packages. "Likewise, dentistry students are required to purchase their own instrument kit, often at a cost comparable to that of a PC. Certainly in specific fields, and eventually across the spectrum of courses available, we will soon see that students aware of the possibilities will be coming to us and saying, 'I have a PC and a modem at home, how can I take advantage of all this information?'"

The implications for distance education are even more significant, he said. "One key measure of learning is the ability to get, and also to give feedback." Learning by remote, which has traditionally been associated with correspondence or by telephone, will increasingly be enhanced by the use of messaging to deliver not only courseware but interaction between teacher and student, he said.

Helen Dancer

Pirates walk the plank

In a potent new ad campaign the Business Software Association of Australia (BSAA) has announced it will continue its practice of giving a reward of \$2500 for information leading to successful actions against software thieves. In addition, the BSAA will no longer be using the term 'piracy', because research indicates the word does not convey the seriousness of the issue.

"This is only part of our campaign," explained Jim MacNamara, chairman of the Business Software Association of Australia. "We are distributing our BSAA Software Compliance and Audit manual, which comprises a diskette with a program that helps you identify up to 800 applications, a three-ring binder on how to do a

software audit and so forth. It's a whole management system to help people manage their software, especially for those working in a multi-user environment."

During its first year the BSAA directed 90 per cent of its funds towards education and only 10 per cent to litigation. Now it is spending 70 per cent on litigation and 30 per cent on education. "Five years ago most computer users didn't even think about copyright. Now, most users are aware of the BSAA and aware that it's not legal to duplicate software."

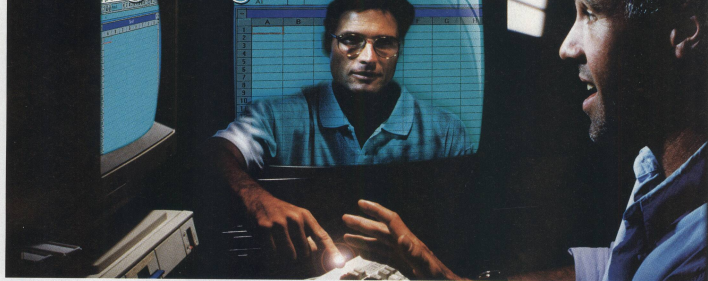
The BSAA has received up to 100 calls a week on its hotline number, indicating the ad has piqued interest. Response from within the industry has also been good.

Mr Pelatidis from major software retailer Downtown Software in Melbourne approved of the advertisement. "This is really a negative term," Mr Pelatidis said, "whereas pirate doesn't have much impact."

Mr Pelatidis also mentioned the use of CD-ROMs as a deterrent against software thievery, an area the BSAA had investigated. Mr MacNamara indicated that, while counterfeit CD-ROMs containing illegal software are being produced, the nascent 'lockable' technology, where a pin number is issued on payment allowing the user to download one copy of the software, is promising.

Nathaniel Tunbridge

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I-way mirage from page 9

tant, he said. Content offers the greatest potential for Australian industry, creating not only better quality of life within Australia, but new export opportunities.

Close on the heels of the conference Mr Downer unveiled the opposition's strategy statement, "The Cultural Frontier", dealing not with the information highway itself but rather its potential to deliver better access to the arts, and expression of our collective cultural talents. Linking local libraries to each other and to city libraries formed a very small part of the strategy, which speculated on the different ways information access could be used to broaden the reach of the arts in Australia and beyond.

The significance of both of these speeches is not so much in their content, but the fact that information technology and the looming prospect of consumer broadband have made it to the political agenda. In a month which saw both IBM and Compaq release home market products in this country without the communications options available in the same machines in the US, (because both vendors found the Austel approval process too arduous), it seems clear that vendors' efforts to

ship products concurrently will take second place to well formulated policy in ensuring that information access in Australia does keep pace with technological advances taking place overseas.

Australian technology providers too, are yet to feel that the government has their interests in its sights. John McDougall, managing director of AWA has expressed disappointment in the extent to which Australian industry has received support. Welcoming the report by the Federal inquiry into government purchasing known as the Bevis Report he said: "It didn't get a lot of coverage in the Hobart conference of the Labor Party last week so we have to keep pushing." A cultural cringe, he said, is stopping Australian technology companies getting a fair share. Now, the proportion of the estimated \$12 billion spent in Australia is only 15 per cent, a figure which he feels is disproportionate to our capability.

"We are not going to see a split of 15 per cent going to foreign companies and 85 per cent to people like us overnight. There's obviously technology we can't ever hope to produce — it has to be bought offshore. But we are not getting our fair share."

Helen Dancer

Interactive politics

Parlidx, an interactive database about responsible government, was launched recently at the NSW Parliament House. The culmination of two years' work by several state government bodies, the system incorporates historical and current information on members of Parliament, their electorates, ministries and the judicial system. Users can weave their way through NSW's colourful political landscape in a very user friendly interactive environment, decorated with

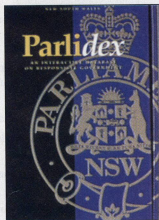
momentous portraiture and colour photographs of current relevance.

Geographic and biographical information come together to offer one of the most fascinating and useful political resources to hit the information market. The first release is a Macintosh application, but the needs of business will soon be accommodated in a DOS version. A CD-ROM delivery will follow with promises of video and sound clips.

"Responsible government is complex, which has often been a deterrent," Anne Cohen, the NSW Chief Secretary told the parliamentarian-studded launch. "Parlidx may aid community members of all ages to better participate through greater understanding of the institutions and their rights, so we as politicians do a better job."

Aimed primarily at the educational, information and lobbyist markets, Parlidx reflects the growing momentum of education in Australia. Regular updates will ensure the product's ongoing relevance.

Dan Tebbutt



Parlidx: NSW political database

Cyber-nasties and wipeouts within the Net

Beware the cyber-nasty! The enormous potential for damaging, immoral and illegal practices online cries out for a few warning signs, if not restricted cyber-surfing areas to ensure some basic safety and privacy rights are observed and also to prevent our young cyber-grommets from being caught in the underworld.

Children were the main concern of the Computer Bulletin Boards' Task Force Report, issued in October. The Task Force, convened by the Federal Attorney-General's Department, identified concerns that bulletin board services (BBS) were being used for the distribution of pornography, copyright-infringing material, stolen credit card numbers and racist and abusive material.

The Task Force report recommends

that the BBS community develop and adopt guidelines in line with current best practice. This would include the development of operator guidelines for compliance with legal and moral standards, information kits for parents and enforcement of guidelines by a complaint-based system mediated by the Office of Film and Literature Classification. An advisory body drawn from the BBS community would act as a medium between government and BBS users and operators. There would also be continued monitoring (presumably by the Task Force) to consider whether tighter control is required.

The second choice option recommended in the report is that a criminal offence of using a BBS for transmitting 'objectionable material' be enacted. 'Ob-

jectionable material' would include matters of 'sex, drug misuse or addiction, crime, cruelty' and so on which would be refused classification.

But cyber-nasties aren't always so obvious. The info highway is becoming more consumer orientated — a virtual marketplace. Mail-surfers know as well as cyber-surfers that there are sharks in the water where money changes hands, so remember there are already lifeguards on this beach.

While the Trade Practices Commission is only investigating anti-competitive pay-TV issues in this area, it does play a role where any goods or services are provided by corporations, BBSs included. False advertising concerning quality, price or even sponsorship is an offence under the Trade

Practices Act and there are similar offences for individuals under State Fair Trading Acts, supervised by Consumer Affairs.

The cost of policing all BBSs is prohibitive and big brother is not watching, at least not all the time. In the US, incidents of fraud and harassment have forced Congress to begin the legislative balancing act between personal privacy and public interest while keeping costs down. Our governments will have to deal with these and other cyber-nasties, and it would be best done sooner rather than later.

Current laws may well be applicable, but the adequacy of our own laws should be examined to ensure that they keep up with, if not ahead of, the wave of cyber-nasties.

Rohan Singh

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Diamond Graphics Accelerators are also award winners and their technology once again leads the graphics accelerator race with the Stealth 64 Speed Demon. At 100+ million Winmarks the Stealth 64 continues to clean up winning accolades all over the world. Along with its "Fastest ever" and "Best Buy" awards the amazing Stealth 64 beat the 64-bit competition in the *Windows Source* (August 1994) graphics card "Shootout".

The Diamond Stealth 64 provides the ultimate partner to ViewSonic's monitor family, achieving that perfect balance of power and vision.

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It's only an operating system, guys!

The new version OS/2, Warp, was launched in Sydney last month with enough razzamatazz to rival even the opening of the 2000 Olympic Games. A galaxy of stars, from the laconic Red Symons, to the customised OS/2 board-wobbling Ralf Harris, ably demonstrated that as technocrats, they were great performers. In a debate which proffered the notion that "Nothing is better than personal computing", we learned that Mr Symons has a degree in Computing Science and Lex Marinos would prefer a date with Elle Macpherson, while Rod Quinlan proved conclusively that a pocket full of chocolates is a more powerful persuader than a good argument, and that a rock can't perform simple arithmetic, even with the aid of a pocket calculator.

It's a pity that the entertainment and information value could not be sustained by the imported IBM presenters which followed the scintillating and highly entertaining debate.

Mercurially eschewing the obvious Star Trek/Star Ship Enterprise theme (apart from Leonard Nimoy's appearance in the promotional Warp video), the company concentrated instead on taking sustained and often repetitive potshots at Microsoft, for its late delivery, slow application launching and file downloading times, and the waiting symbol hourglass.

The climax of the show was the explosion of a giant hourglass on stage. If you hadn't got the point by then, that would have probably done it. If you had, and then drifted off to sleep as example after example of systems were rolled out (virtually) on twin giant screens. It served the valuable purpose of waking you up and signalling that at last the presentation had come to an end.

Voicing the question on everyone's lips, former SMH computer section editor Gareth Powell asked whether IBM in Australia had concerns about adopting the OS/2 Warp catchcry "It's time", a phrase forever inscribed on the Australian psyche as being associated with a political party sacked from office under the most heinous of circumstances. The answer? "Thank you, Gareth. No."

Helen Dancer

SYSTEMS

Pentium notebooks beat the heat

How do you keep a pentium chip cool when it's inside a notebook that's too small for a cooling fan? The latest approach to notebook refrigeration, slated for use in upcoming Pentium-based ThinkPads, is to minimise power usage so that less heat is generated.

A Pentium will quit working when it reaches over 200 degrees Fahrenheit, and conventional heat sinks can reduce the temperature to around 160 degrees. "The CPU should really be no hotter than 95 degrees," explains David Baczewski of Pico Power, a controller maker recently bought by Cirrus Logic. To solve the problem, Pico Power designed the Golden Gate Pentium Interface Controller, a power management chip that sits next to the Pentium and keeps an eye on the clock. When power is full blast for too long, it "throttles the clock" by changing the frequency of the CPU's clock on a nanosecond basis. With the CPU drawing less than one watt, the

temperature drops to a more comfortable 95 degrees.

"For the most part, applications don't require the full bandwidth of the CPU," explains Mr Baczewski. "The CPU is really required to run at maximum frequency (speed) only about 10 per cent of the time. In some cases, the chip can detect if there's no bus activity and stop the clock entirely," reducing battery drain as well as heat.

Inventors have come up with an assortment of exotic liquid-cooling and heat-transfer techniques designed to prevent powerful notebooks from melting in your lap. Some methods use a liquid coolant that pulls excess heat off the chip, much like a radiator in a car.

As the Pentium heats up, the fluid boils and a tube ferries the vapours to a condenser, where they're cooled and condensed back to a liquid. A second tube drains the liquid to a holding tray. Another approach, used by Twinhead, uses a miniature thermostatic fan on top of the heat sink to draw the hot air out a vent located near the keyboard.

Both Toshiba and Texas Instruments have also announced new Pentium-based notebooks as we go to press. The Toshiba T4900CT will be available from late this month and will be featured in December APC.

Carol Levin

Rumour bites into the big Apple

Apple stock has soared by up to 12 per cent on the US stock exchange after speculation that the company is in the takeover sights of Motorola.

The rise was the exception in a bearish market which recorded a composite lower closing on a day when Apple's stock rose \$4.12 to \$37.87.

Neither Apple nor Motorola have commented on the speculation, but Motorola's release of a new line of PCs encouraged the market even further.

The PC range, called PowerStack, is based on the PowerPC chip, and was designed and built by the triumvirate Motorola, Apple and IBM. Motorola's plans for the range include upgrading it to support other operating systems, notably Apple's.

Motorola's entry into a market in which it failed earlier this decade is being read by the market as a play to kickstart sales for the PowerPC, fuelling its ability to compete with Pentium. While Apple remains the only supplier of machines based on this chip type, analysts say the processor has less chance of competing successfully against Pentium in the target sector — the high-end PCs and server market, estimated to be worth more than \$US10 billion.

But if it is true that Apple is for sale, Motorola is not the only company standing in line. Reuters News Service reports that IBM has had talks with Apple about an acquisition at around \$US35 per share, but that there was no resolution to the discussion. It is believed that the estimated \$US4.5 billion price tag proved too high for IBM.

Further rumours are that AT&T is also a suitor, without clarification as to the state of negotiations.

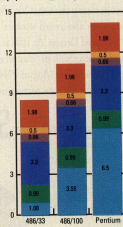
While there is a direct relationship between the product strategies of Apple and the first two prospects, the possibility of being acquired by AT&T shows more longer-term synergy, with implications for the growing trend towards computing and telephonic convergence. This option however, is perceived by analysts to be the least likely. Bruce Lupatkin, an analyst with Hambrecht and Quist, told Associated Press that while the takeover doesn't make sense, that doesn't necessarily mean it won't happen. Apple would have made a more attractive takeover target a year ago, he said, when it was at its lowest profit ebb, and had only recently begun its restructuring programme.

Helen Dancer

Notebook power profile

The Pentium chip consumes more power and generates more heat than other chips. Pico Power's hardware-based technique can reduce CPU power usage to a single watt.

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Power push signals change in momentum

There's a great deal of covert interest in the PowerPC and Macintosh operating system, if off the cuff comments from some of the industry's largest players is anything to go by.

First off the mark was IBM's Jim Cannavino who was reported in Associated Press to have said that IBM had a Macintosh 'clone' ('on the drawing board'). While Apple Australia managing director Steve Yarnos is not rushing to claim IBM's decision as definitive, he is quietly confident of the trend that the comment signals.

"I think that what possibly happened was that Jim was caught out making a casual comment, and we might yet see the comment put into a proper context, which would make the reality of the comment slightly lower key, but if it is true then we welcome it. Obviously we feel that the Mac OS is great, and the more support for it the better pleased we will be. It is an indication that the potential of Apple technology is generating a lot of interest in the industry at large."

Toshiba too has joined the move with the announcement on October 6 that it will license PowerPC RISC technology, as well as AIX (Unix) from IBM. The five-year agreement will see Toshiba initially making use of the high end 620 and in the long term developing its own PowerPC chip.

Even Compaq, now at odds with long-time microprocessor supplier Intel ('Compaq chooses Cyrix instead' story opposite), has suggested that since the transition from Pentium to P6 or P7 is not as linear as previous incarnations, the PowerPC may represent an interesting proposition. "Intel's P6 architecture is very different," said Gary Stimac, Compaq's senior vice president. "When we design systems for the P6 it turns out that with some minor modifications we can support the PowerPC." Compaq, he said, is considering the technology for its next generation high-end PCs and servers. Making light of the suggestion, Compaq in Australia was quick to reinforce that Compaq laboratories are constantly evaluating new technologies, PowerPC among them.

But the suggestion is nevertheless a

powerful one, with Compaq's discontent over the 'Intel inside' branding which it says interferes with its own brand recognition efforts, and Intel's refusal to negotiate more attractive bulk deals. The discontent is currently manifesting itself in an agreement to supply recently announced with AMD and rumoured negotiations with Cyrix. While this is cause enough for concern, one might think that the quantum leap from change of supplier to adopting a new processor type might be a prospect to cause the collective Intel heart to momentarily flutter?

Not necessarily, according to Intel Australia's managing director Geoff Healey. "It's a question of capacity, and our ability to supply is unparalleled. We have been investing more than \$US2 billion worldwide per year on production facilities, currently outpacing our competition in that regard by 2:1."

Indeed Dataquest in the US estimated that 4.6 million Pentium chips would be marketed worldwide this year, compared to two million PowerPC chips. Intel is well positioned, says Mr Healey, to meet quotas and to stay ahead of the competition on capacity.

As to the question of the transition to any new generation of processor, he denies the possibility of a radical shift. "I don't see it being in Intel's interest to bring in the P6 or whatever, with a tough hand off. It doesn't make sense, nor, given the evolution we have seen, does it seem very likely. Already we have seen that the latest incarnation, the Pentium, is more RISC-like, while RISC processors are also incorporating the successful elements of CISC technology. It's a melting pot, not a technology shift."

However, he is also the first to concede the pressure being put on old alliances, and the volatility of an industry signing new deals. And while there seems little doubt that the majority of boxes shipped over the next 12 months will be 'Intel Inside', the corollary of the speculation is that while being outbid in the short term, the momentum of processor sales over that same period may shift dramatically, in PowerPC's favour.

Helen Dancer

Compaq chooses Cyrix instead

Compaq Computer is fanning the flames of a feud with Intel Corporation, by seeking another chip supplier. Compaq is currently negotiating a deal with Intel rival, Cyrix Corporation.

Compaq is seeking other chip suppliers to escape the high prices Intel has been charging for its Pentium chip, according to sources. Intel Pentiums range in price from \$US935 to \$US383 per 1000 units. However when questioned, Compaq spokesperson Yvonne Donaldson would respond only that, "Compaq has a multivendor strategy for all components." Cyrix could not be reached for comment.

The Cyrix microprocessor that Compaq is reportedly interested in is the M1, a Pentium class chip. Compaq may incorporate the chip into its desktop systems such as the ProLinea and Deskpro lines, as well as its low-end server line, the ProSignia.

Reportedly, Compaq plans to gain a global licence for the

M1 chip and its derivatives. Compaq will then design its own versions of the chip, but it will choose another company to manufacture the processor. SGS-Thomson is rumoured to be Compaq's choice and it is believed the mask of the chip has already been shipped to the company. If so, the M1 chip may be in production by the first quarter of next year.

Intel spokesperson Joanne Hasegawa said the company would "continue to do what it had been doing, which is working hard to keep Compaq as a valued customer".

This is not the first time Compaq has looked elsewhere for its microprocessors. Last month, the company struck a deal that would place Advanced Micro Devices' (AMD) microprocessors inside its corporate and consumer PCs.

Prior to that announcement, Intel had been Compaq's sole chip supplier.

Monica Snell
Editech

Beat them, join them, and beat them again

Slapping the face of competition, Microware Systems Corp has released software that will allow the development of its OS-9 applications via a competing Windows operating system. Called FastTrak, the real-time cross-development tool is designed for programmers using Windows to develop real-time OS-9 applications.

FastTrak for Windows replaces PC Bridge, the DOS-based precursor that developers on PCs were formerly restricted to when creating OS-9 applications. Far from a corporate agreement with Microsoft, the Windows port was a response to Microware customers. "We are not working together [with Microsoft]," emphasised Microware tools product manager Brian Steffen.

Using Windows 3.1 on 386, 486, and Pentium microprocessors, FastTrak for Win-

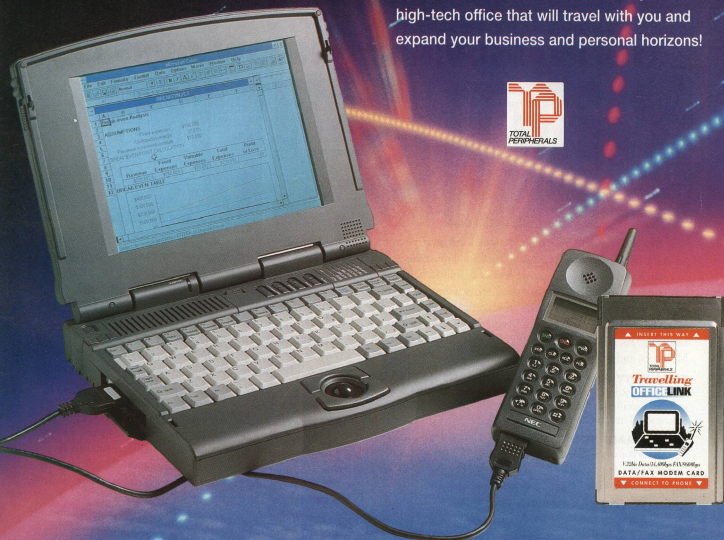
dows facilitates the development of C-based OS-9 applications for Intel 80x86, Motorola 680x0, and PowerPC systems. The tool consists of editing, debugging, and monitoring modules by which programmers can develop and maintain OS-9 applications. Microware has long been a thorn in the flesh of Microsoft Corp, which tried unsuccessfully to compete against the small Des Moines, Iowa-based company in the set-top box operating system market. Well established in the industry, Microware's Digital Audio/Video Interactive Decoder (DAVID) has become a de facto OS standard in set-top boxes made by IBM, NEC, Philips Consumer Electronics, and Zenith. Now Microware, through the Modular Windows and Tiger operating systems, is playing catch-up in the interactive TV market. Brian Riggs
Editech

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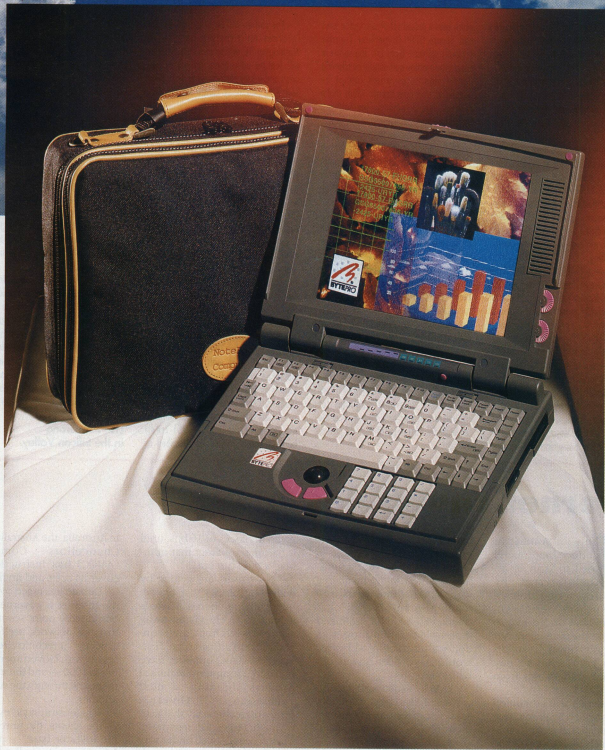
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NETWORKING

Internet news

The Internet is hot, and US companies are investing megabucks in the technology. Market research firm Killen & Associates predicts that by 1998, US companies will have spent nearly three quarters of a billion US dollars to acquire data communications services and equipment that will support commercial applications on the Internet.

Companies will spend the vast sum on equipment such as software, modems and switches and service charges to CompuServe and other companies which facilitate connection to the Internet, said Killen & Associates' president, Michael Killen. He predicted the most rapid growth would be in the area of Internet transaction processing.

Improved security will help the "Net" to attract more business users and security applications for the Internet GUI Mosaic is the latest trend. Featured are offerings from Terisa Systems, Mosaic Communications and tiny US start-up NetMarket Company.

Recently formed Terisa Systems is developing a secure version of the National Centre for Supercomputing Applications (NCSA)'s Mosaic interface. Terisa Systems is a joint venture created by RSA Data Security and Enterprise Integration Technologies (EIT). Terisa's secure Mosaic will be based on RSA's public key encryption cryptography

which uses a paired set of encryption keys and Secure-HTTP (HyperText Transfer Protocol) software from EIT. The software ensures transaction authenticity by allowing digital signatures which cannot be repudiated and time stamps which make contracts legally binding. The software should be widely available later this year.

Mosaic Communications Corporation is offering the Mosaic NetScope software for information exchange and Internet commerce. The application features encryption and server authentication security enhancements.

NetMarket Company has already enabled the first electronically secure credit card transaction over the Internet. The event occurred in August using an encryption service based on Pretty Good Privacy software developed by US computer security consultant Philip Zimmerman. NetMarket's technology permits automatically encrypted Unix based Mosaic sessions.

In other developments on the net, the first all-day Internet radio station will be launched in January. International Internet surfers will have the option of listening, storing, searching databases for desired broadcasts and augmenting the 24-hour data stream with text and picture files.

The station will be broadcast by the Internet Multicasting Service in Washington DC, whose new radio station will feature educational programs, lectures and youth performances from New York City's Kennedy Centre for the Performing Arts.

The Cyberspace station will also broadcast live speeches and debates from the US Government's House of Representatives and Senate floors. Recordings of book and poetry readings by famous authors will also be featured broadcasts.

Radio Technology for Mankind (RTFM) cyberstation will carry the broadcasts.

The legal implications of the net continue to be ironed out. The Internet is no longer a free zone of unmonitored data since a California man recently received the unfortunate distinction of becoming the first person charged with false Internet advertising.

The US Federal Trade Commission (FTC) on September 12 charged Brian Corzine of California with making untrue claims on America Online. Corzine, also known as Brian Chase, claimed that his business, Chase Consulting, could provide consumers with a "brand new credit file at all three of the major (US) credit bureaus". The method he described as

"100 per cent legal and 200 per cent guaranteed" was seen as a violation of US law by the FTC. The fate of Mr Corzine and Chase Consulting is a legal matter to be decided by the US court.

In the area of shopping on the net, a new interactive Internet shopping software program has been chosen by the US's Home Shopping Network (HSN). HSN has picked California-based Macromedia to develop the software.

The program will be based on Macromedia's Director and will be used on HSN's Internet Shopping Network subsidiary to let shoppers inspect goods for sale with a high quality graphic, animation, sound and video interface. The package should be ready in early 1995.

For cyber surfers trying to find their way through the multitude of addresses, two directories are now available for the Internet. New Riders' recently published Official Internet Yellow Pages lists over 10,000 specific resources available on the Net. Alphabetical listings, complete with addresses and descriptions, are contained under topical headings such as Entertainment, Freebies and Information on the Internet itself.

Lisa Armstrong
lisa in the Silicon Valley

Internet squabbles

When an American called Jim Cashel tried to cash in on the Internet by registering domain names such as hertz.com, media pressure forced him to relinquish the names rather than follow through on his plan for companies to buy back their trademarks from him.

An independent arbitration panel also ruled against a New York educational testing company which tried to hijack the Kaplan trademark of its major rival, the Princeton Review, and turn it into its own Internet name.

In Australia, no conflicts have yet arisen, although domain names are proliferat-

ing at such a rate that advanced technical planning is under way to prevent a numbers crisis. Stopgap measures were taken three years ago when the Internet's local overseer, AARNet, realised that unless something was done, all available addresses would have been given out within months.

AARNet's network technical manager, Geoff Houston, says if someone wants to call themselves coca-cola.com.au, they can expect Coke's lawyers to come calling: "It's not our problem — there are well-defined laws on business names, trademarks and copyright."

On diminishing addresses, he says they were originally

given in blocks of 16 bits, until it became apparent that numbers would run out.

"Now users are getting by with 8-bit blocks that are sequentially numbered. There is a limit to freely giving away addresses without any conventions on a first-come, first-served basis, but we have initiated a long-term technical process defining a next generation of IP (Internet Protocol) technology that uses a much larger address base. That process is well under way with a 16-byte or 128-bit address format.

AARNet doesn't charge for domain names with its IP addresses and accompanying email addresses, and the governing body of the Internet

in Australia, the Australian Vice Chancellors' Committee (AVCC) has instructions to cover its costs and no more.

Debate has raged over how the Internet is governed here, but the key point seems to be that the network itself is one aspect — a technical resource set up with Government funding in 1990 — and the management of it through the AV-CC is another.

Mr Houston says "everyone — the clients, the universities, the investor base — runs the Internet in Australia. It's just another aspect of private investment in telecommunications services, and in that sense is no different from an AAP or Reuters' news service".

Thomas Liddle



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Now, the Internet at 500kbs!

While debate rages over exactly how interactive services will be delivered to the home, Telecom is quietly negotiating with News Corp and Microsoft and laying fibre optic cable — 30,000 homes have been passed already — and OptusVision partner Continental Cablevision is talking about Internet and CompuServe access at 500Kbs.

The fastest modem speed to a PC is 28.8Kbs. A normal ISDN link runs at 64Kbs, 178 times slower than the fibre-cable link, and costs several hundred dollars a month.

Trials in Boston of the high-speed data lines have now been extended to full commercial services at \$US99 a month in Massachusetts, New England and New Hampshire. Those speeds are also capable of handling full interactive multimedia services including digital shopping, now available only on CD.

While OptusVision partners, the Nine and Seven Networks and Continental announced plans to wire up 50 per cent of Australian homes with mainly overhead fibre optic-coaxial links within four years, Telecom officials point out that they are already laying underground cable and will easily surpass their target of 1.1 million homes passed within three years.

Telecom says it will match any OptusVision plans for interactive services to PCs. The data segment of the broadband services to homes takes up the equivalent of about one video channel out of more than 60 channels planned to go to each home.

Continental's executive director, Martin Hannes, says that while pundits argue over whether the exit ramp for the superhighway into the home will be the 'set-top box' atop the home television set or a personal computer, his company is already delivering online services from Internet email to Mosaic pages to PCs at high-speed and low cost.

"We'll be putting in the network anyway, and what will probably happen is that the cable to the home will be split into three components:

1. The TV set and video for your entertainment product,
2. The telephone for phone and fax services,
3. Your home computer for data, the Internet and CompuServe."

Thomas Liddle

PERIPHERALS

The path to better displays?

New fabrication techniques for creating screens based on the polysilicon technology that's used in high-resolution, diminutive camcorder viewing screens could result in higher-resolution LCDs than those now found on laptop computers. But researchers must overcome several obstacles before this technology is suitable for notebook displays.

Most LCD transistors are made with amorphous silicon. Although suitable for the colourful screen found in high-end portable computers, amorphous silicon can't deliver the high-pixel densities that polysilicon fabrication can achieve. Companies like Hitachi and Seiko-Epson have introduced new polysilicon products for the

projection and head-mounted display markets. NEC, Sharp, Toshiba, and others have demonstrated prototype polysilicon displays for the HDTV market. But until manufacturers perfect new processing techniques for large format polysilicon, the technology will be relegated to virtual reality and projection applications.

Although polysilicon technology has many benefits, it also has its challenges. The high-temperature fabrication process that is the most mature for creating polysilicon transistors requires the use of quartz substrates, because glass substrates would melt. As well as being more expensive to produce than glass substrates, quartz substrates are limited to 20cm in diameter, which also limits

the size of the resulting display. Companies in Japan and the US are investigating low-temperature processes, but researchers don't expect larger-format polysilicon displays until the next century.

Another obstacle to polysilicon is the demand for active matrix displays, which is driving manufacturers to expand amorphous capacity, the overpowering consideration of polysilicon. "Virtual reality hasn't taken off yet, so there isn't a market for these (polysilicon) displays," says Joel Pollack, display product-marketing manager at Sharp Microelectronics. "The projector market is experiencing steady growth, but it is still minuscule compared to the notebook or small TV market."

Chris Chinnock

Smart card's day is coming

The days of carrying a plethora of plastic cards in wallets and purses may be coming to an end as 'smart cards' rapidly gain acceptance in the consumer world.

From credit cards and ATM cards to telephone calling cards and drivers' licences, modern life is driven by those pieces of plastic carried every day. But with the growing acceptance of smart card technology, all the information in the plastic that a person carries can be placed in one convenient card.

Smart cards are similar to credit cards, but a microchip has been embedded into them which lets them store large amounts of data and also interact with computers. So far due to technical and economical difficulties, the cards have appeared only in niche markets. One barrier to acceptance is that small companies are reluctant to pay for installing expen-

sive equipment which can read the cards.

The acceptance of the technology is being pushed by a consortium called the Smart Card Forum, which includes companies such as Visa International, MasterCard, American Express and various banks, telecommunications and computer companies.

"While smart cards have been around since the mid-70s and have been utilised in a variety of applications abroad, their acceptance is only now beginning to gain momentum in the US," said Catherine Allen, president of the Smart Card Forum and a vice president at Citicorp's Technology office.

Several factors are increasing the number of applications for smart cards. IT, transaction processing, consumer electronics and telecommunications are all converging and these will benefit from the access, control and security of

smart cards, she said. Also, the cost of manufacturing the smart cards is decreasing.

Allen said that card-related fraud can be significantly reduced by smart card technology, and this is why so many credit-card companies are involved in its development.

Besides financial services, other areas will benefit from the smart card technology. One is the retail sector which can offer customers a more convenient way to pay than carrying cash or cheques. The cards can also attract customers by offering services such as "frequent buyer" coupons and discounts. Health care may also be changed by the cards. President Clinton announced the use of a national health card, which the smart card can fulfill. It will reduce the need for patients to fill out forms and help ensure quicker out-of-pocket reimbursement.

Martin Cheek
Editech

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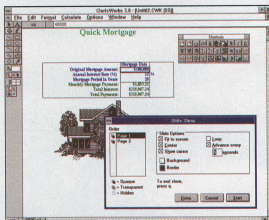
Raw from the coders' claws comes ClarisWorks Version 3.0. A beta copy of the new version, due in the stores by late November, was forwarded to APC for review.

The strength of ClarisWorks, from its beginnings on the Macintosh to the latest Windows version, has always been its ease of use combined with great functionality. The program's workspace allows compound documents to be created and manipulated with ease and the product's feature set is capable of satisfying the everyday needs of many PC users.

Version 3.0 offers new capabilities and refinements developed since Version 2.0's release. Based on 32-bit code, ClarisWorks 3.0 is Windows95 ready and ideal for NT workstations. Windows 3.1 or 3.11 boxes need to load Win32's drivers during installation.

All-in-one programs have traditionally been viewed as limited versions of complete applications — suitable for a few users but not the majority. Containing an extensive refined feature set, ClarisWorks 3.0 defies this typecasting.

Formatted text, spreadsheets, charts, pictures and database information can be



ClarisWorks Slide Show: easily formatted presentations

editing the text, the toolbar displays application independent buttons such as 'save' and 'print' as well as word processing specific tools such as line spacing and text alignment. A double click of the mouse on the spreadsheet portion of the report causes the toolbar to be spreadsheet-oriented; whilst application independent icons remain, tools for calculation replace those for word processing.

Admittedly, the spreadsheet module is not suited to complex calculations — it is far from ideal as a tool with which to design the next space shuttle. Scientific functions are limited but it does include basic trigonometric, statistical and financial commands.

The word processing capability of the program offers great intricacy. Aside from crucial components, the module includes support for styles, tab setting, mouse/menu customised rulers and document templates (called 'stationery'). A common thesaurus and spell checker are provided.

Documents can be extensively outlined in the new version with customised or preset formats including numeric, Harvard, legal, bullet and checklist.

While I personally avoid all manner of drawing programs in the name of good taste, ClarisWorks has the necessary tools to add colour and life to documents. Palettes for colour, shading, gradient, pattern and line width can all be dragged from the menu bar to the desktop. The drawing and painting modules are brilliant when com-

bined with the slide show utility. Simple presentations are easily created — masterpieces can be automated or user-prompted and can include Microsoft Video for Windows clips.

An expanded clip art library, support for multiple columns of varying width, gradient shading in text boxes, numerous chart types including the always effective 3D graph, auto database field entries and the ability to wrap text around images are all features that have been enhanced in Version 3.0.

The ClarisWorks database is almost identical to Claris FileMaker Pro. This popular database style has an intuitive interface but the Works version, designed for a dedicated user, does away with security features including even basic password protection.

Claris has added a utility it calls ClarisWorks Assistants designed to guide users through several different procedures. Seven Assistants modules will ship with Version 3.0, including guides for presentations and name and address databases. New Assistants can be added to the software retrospectively.

One of the major benefits Works offers is its cross-platform compatibility with Macintosh and Windows. The GUI and document file format are identical and the program uses ClarisXTND technology as a cross platform, universal file format filtering system.

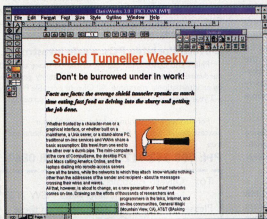
ClarisWorks is impressive. A full installation only requires 9M of hard drive — 5M less than MS Works 3 and only a fraction of the space required for a full software suite — yet offers a superb feature set. What is almost unbelievable is the price tag. \$174 buys this package bundled with Claris FaxWorks until January 31, 1995.

Ben Gerholt.

*ClarisWorks Version 3.0 for Windows
Distributor: Dataflow, Merisel, Tech Pacific
Phone: (02) 310 2020, (02) 882 8888,
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Price: \$174 bundled with FaxWorks until January 31, 1995.

In short: Windows95 ready, this all-in-one software package offers ease of use, compound documents, and great features. ClarisWorks Version 3.0 is simply top value.



Graphics, spreadsheets and text combine for powerful documents

combined into a single compound document with ease. In effect, a ClarisWorks document is a combination of different objects. The workspace allows these objects to be edited without the need to launch separate applications. The ClarisWorks floating Shortcuts toolbar simplifies the working transition between these objects by displaying related tools. For example, a report may consist of both word processing and spreadsheet objects. When

How easy is it to operate the new HP ScanJet 3p and IIcx scanners?



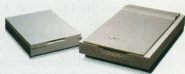
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MAC MICROSOFT OFFICE, WORD, EXCEL, POWERPOINT

Microsoft Office 4.2 is poised to take the Macintosh applications market by storm. Integrating market leading word processing, spreadsheet, and presentation software, it gives the Power Macintosh a welcome leg-up, finally bringing Mac users to parity with Windows colleagues.

Essentially, these applications are indistinguishable from the Windows products, except they are genuine Macintosh applications. The best of both worlds is not a fanciful tag.

Microsoft has long been the leader in each of the individual Macintosh components. With Lotus apparently abandoning Power Macintosh, except Notes and cc:Mail, Microsoft alone has a full house in the Mac suite market. Apart from worthy niche players, Microsoft might establish an irresistible hegemony among Power Mac users: it may crush arguably superior competitors because users who fork out for a suite will not add another specialist package.

Enough whys and wherefores. Does Microsoft Office 4.2 deliver the goods?

Quite simply, it does. Although it has some drawbacks, its promises are fulfilled. Office can be strongly recommended if you need the features, and provided you have the hardware to support it.

MS Office Manager sits in the menu bar for application launching (including third party). Particularly laudable is Quick-Switch (Command+Tab) toggling between applications — one Windows feature you miss in Macintosh.

Microsoft Office Manager menu

Installation is a breeze, with problems and options well explained. Hard disks benefit through sharing of resources like dictionaries, thesaurus and grammar references.

Office 4.2 implements Object Linking and Embedding 2.0 for more productive sharing of data among applications. Under OLE 2.0, you can, for example, embed an Excel spreadsheet in a Word file; when you edit the embedded object, the menus automatically become those of Excel, bringing full Excel functionality into the word processor.

Help resources and automation are more powerful. Applications offer tips, and an expansive, hypertext-based help system assists users of all levels. 'Wizards' remove dreariness from complex tasks,

and ensure novice users produce professional output.

Cross platform congruity has been greatly improved, founded on core code between versions. Some superior Mac features have been compromised, but the thrust is positive — it makes mixed-platform business networks less problematic. Each application has a common file format between Windows and Mac: mixed users will be pleased to see the back of filtering and translation. Collaborative computing becomes easier, with cross-platform consistency and Apple's System 7.5 collaboration tools integrated into Office applications.

Microsoft Office 4.2 is poised to unleash a powerful force on the Macintosh software market. Not only Mac users, but anyone working in a heterogeneous computing environment will feel its effect. Valuable productivity tools, consistent interfaces and true cross-platform uniformity are the fruit of Microsoft's latest innovations.

Microsoft Office 4.2

Distributor: Microsoft

Phone: (02) 870 2100

Price: \$1095 (customers buying Office 3.0 after August 1 entitled to free upgrade)

Availability: November

In short: MS Office 4.2 sets a new standard for personal and business productivity on the Macintosh, with consistent interfaces, OLE 2.0, cross-platform compatibility and a range of notable power tools.

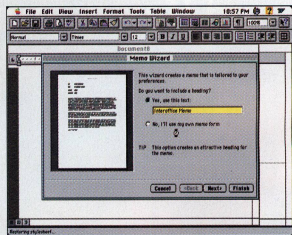
Microsoft Word 6.0 for Macintosh

Word 6.0 has every desirable whistle and bell, and a few more to boot. Nevertheless, it is not perfect.

First the good news. Word 6.0 at last brings Macintosh users powerful appurtenances Windows colleagues have been enjoying. Interface modifications have favoured Windows, but do not present difficulties for common functions. Dialog boxes may overwhelm with their

myriad options: stay calm, it becomes easier with use. Controls are not harder, but there are many more of them and they are reorganised. Gone are some familiar keystrokes, but these can always be reconfigured. The Mac version has come off second best on header/footer controls, preferences and thesaurus interface.

Considering Word 6.0's rich feature list, the amended interface becomes a small price to pay. Pausing the pointer over buttons on the user friendly toolbar describes their function.



Microsoft Word 6.0 for Macintosh offers unprecedented automation to quickly produce professional looking word processing documents

AutoFormat templates and Wizards guide creation of standard documents, incorporating enough simple desktop publishing features for many users. Table AutoFormat ensures information is professionally presented with a minimum of effort and time.

Innovative editing tools make work more efficient, even for clumsy-typists. AutoCorrect substitutes commonly mistyped words upon pressing the space bar; the syllabus supplied can be supplemented with 'favourite' types. AutoText allows you to easily reinstate common text and graphics, with or without formatting. A variety of fields can be used to insert editing, history and administration data into files. Up to 100 levels of undo and redo are supported, though this taxes memory.

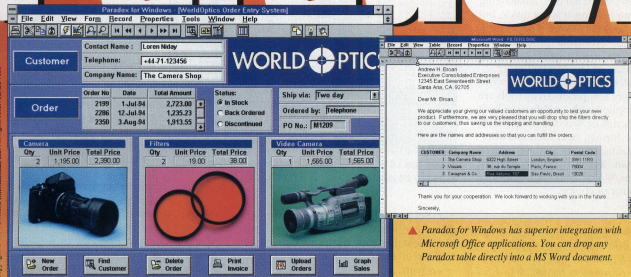
Collaborative computing is catered for: forms can be created, for online or hard copy completion. Forms have fields (text, check box, and drop-down menus), for which the manager assigns access privileges, and specifies certain data types, formatting, and default text. If Word starts to sound like a miniature Lotus Notes, this is not merely fortuitous from Microsoft's viewpoint.

Revision management coherently tracks comments by editors or colleagues. QuickDraw GX, Apple's new advanced

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printing and page definition system, is supported, and mail merge features have been refined.

Word 6.0 supports both AppleScript and Visual Basic, incorporating the Mac version's first macro system. Automation continues to get easier and more powerful.

On the downside, Word 6.0 is a disk hog. While you can contain the installation size to a reasonable 4.5M, file sizes grow with OLE support. Alas, this trade off is prevalent among most feature rich applications.

Speed-wise, Word 6.0 is no flash: being so replete with features it is not quick, but nor is it annoyingly slow. The version tested was for Motorola processors; a quicker PowerPC native mode version is slated for release in late November.

Word 6.0 is a state-of-the-art word processor. Very few productivity tools are either not supplied with, or able to be built with, AppleScript or WordBasic. It shares the same file format, near identical interface and dazzling array of features with its Windows twin. Reserving some concern about file size, Word 6.0 would be my Mac word processor of choice.

Dan Tebbutt

Microsoft Word 6.0

Distributor: Microsoft
Phone: (02) 870 2100

Price: \$695 (customers buying Word 5.1 after August 1 entitled to free upgrade).
Availability: October (standard), November (PowerPC native)

System requirements: System 7, 68020 or higher or PowerPC, 4M RAM (8M recommended)

In short: The most fully-featured word processing product on the Macintosh market, Word 6.0 brings Mac users in line with WinWord 6.0 with numerous productivity enhancements.

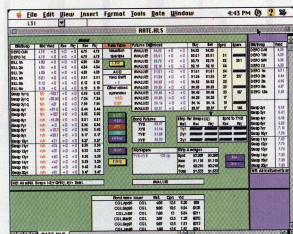
Microsoft Excel 5.0 for Macintosh

Spreadsheets were the 'killer' application that transformed personal computers into serious business productivity tools. In Excel 5.0, Microsoft refines the art of number crunching, packing a multitude of new features.

Like its Office siblings, Excel 5.0 incorporates IntelliSense technology such as Tip Wizard, Drag and Plot chart updating, and AutoFilter data manipulation. The PivotTable allows data to be examined from multidimensional aspects: chart-building is guided by a step-by-step wizard. Perhaps the information supplied is insufficient for the neophyte, but anyone with Excel familiarity will breeze through. Decision making is aided through the

Scenario Manager, teamed with the PivotTable for sophisticated reporting and analysis.

SQL and FoxPro data can be accessed through ODBC technology: this process is supplemented by Microsoft Query 1.0, a standalone application bundled with Excel



Microsoft Excel 5.0 for Macintosh is a best-of-breed spreadsheet, jam-packed with functionality and perfect to take advantage of PowerPC

5.0. SoHo users would benefit through direct connectivity to popular databases like FileMaker Pro, but power users will find Excel and Query a force to be reckoned with.

Workgroups are well catered for in Excel 5.0. A workgroup toolbar expedites functions such as file sharing, mailing and routing for input. Installation was not perfect in my experience, perhaps merely a pre-release problem; the application itself did not crash.

Visual Basic for Applications (VBA) is engineered into Excel 5.0, allowing for cosier integration with Word and PowerPoint on both Windows and Mac platforms. Excel's macro language survives with enhancements.

From the Mac perspective, Excel has many strong features. It harnesses System 7.5's power tools, QuickDraw GX printing, PowerTalk, and AppleScript. Its cross-platform functionality is superb: APC tested complex merchant banking applications created in Excel 4.0 for Windows and experienced few difficulties. Support costs can be reduced through the alignment of functionality among the Mac, Power Mac, Windows and NT editions of Excel 5.0.

It boasts the common 'look and feel' of the Office 4.2 suite, with toolbars and menus consistent to the limits of practicality. Excel will be the first native PowerPC Office application — and the one best suited to raising its spinner in PowerPC's tailwind, since RISC chips thrive on number crunching. Users will be

able to install either a standard or Power Mac version; alternatively they can opt for a 'fat binary' — the same executable file for either processor. Though rather RAM hungry, Excel makes good use of virtual memory.

Excel is complex and feature laden. It elevates the standard of its ilk, offering users the design, tools and ease of use to seize control of their PowerPCs. The ball is now firmly in the competitor's court to return Microsoft's big serve . . . though just who the competition is may be the problem.

Dan Tebbutt

Microsoft Excel 5.0

Distributor: Microsoft

Phone: (02) 870 2100

Price: \$695 (customers buying Excel 4.0 after August 1 entitled to free upgrade).

Availability: September (standard and PowerPC native)

System requirements: System 7, 68020 or higher, 4M RAM

(8M recommended); native mode requires System 7.1, PowerPC, 8M RAM

In short: Complex and rich in functions, Excel 5.0 is a power solution builders dream. Exploiting the PowerPC, it offers automation, stylish design and cracking performance in a comprehensive spreadsheet.

Microsoft PowerPoint 4.0 for Macintosh

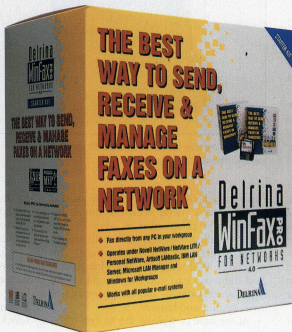
Presentation software is increasingly prevalent in business organisations, indicating a technically literate, dynamic organisation. Impressive, professional multimedia displays can be produced with great facility by even relatively inexperienced computer operators.

PowerPoint, Microsoft's offering in this field, is a solid program with strong credentials to recommend it on its own merits. It is an 'outstanding' product probably only when considered as part of the MS Office suite, not simply in terms of value for money but also because of OfficeLinks' inter-application functionality.

As with other Office components, PowerPoint offers tips on start up. Its user assistance is much more advanced than this simple tutorial system: PowerPoint actually works to guide users, who may be totally bereft of artistic or presentational skills, through the creative process. Using the AutoContent Wizard, the results are

Continued on page 42

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SPECTRUM MOBILE OFFICE

The Spectrum Universe Mobile Office comes in a variety of configurations. The configuration sent to APC was comprised of a Spectrum Universe notebook, an NEC P3 mobile phone, an Xcell Cellular fax and data modem interface, an XcellLink PCMCIA fax and data modem, and a large battery, large carry case and connection cables.

Our Spectrum Universe notebook was of the 486 DX2/66 MHz variety, and sported a total of 8M of RAM (4M is standard). It was quite easy to remove parts from the notebook, but it looks well-constructed, and has a solid feel. However, the keyboard may be a bit small and cramped for some, and the keys had a limited travel. The black and white display was disappointing, and if you were thinking about spending some time working remotely, then consider the dual scan passive matrix colour screen. The cost to upgrade from black and white is an extra \$950. However, for a mere \$2600 over the black and white machine, a colour TFT Active Matrix screen can be yours. This would be money well spent if you want to work on the road, or wish to use the machine for demonstrations.

The current mobile office is built around the Xcell interface unit. This item allows the office to be mobile, and all the other items simply build on this foundation. It is possible to use this unit with other components, such as an existing mobile phone or laptop. The only requirements are that these items meet the specifications of the Spectrum equipment.

Another important component of this system was the XcellLink PCMCIA card. This is an impressive fax modem, good for transmission speeds of up to 14.4Kbps. The card retails for about \$495, and is a worthwhile investment in any case. Spectrum has recently revealed plans to introduce a Cellular version of the Xcell-Link PCMCIA card, and this should be coming out soon, at a retail cost of \$795. The cellular version will allow a cable to connect directly to the PCMCIA card and mobile phone data port.

This system has been around for quite some time, but the gel cell external battery pack has been a very recent incorporation. The external battery pack comes in two sizes, single or double brick. Spectrum claimed a battery life of two hours of continuous operation for the smaller battery, whilst the larger battery should be good for four hours.

The mobile office turned out to be transportable rather than portable. The



Take the best and worst features of your office with you — computing, communications and cabling problems.

carry case provided was made from real leather and a metal skeleton, but it appeared to be pregnant even when empty. After we filled the carry case with equipment, it grew in size and weight. The notebook itself weighs in at 2.9 kilograms, and then you can add the weight of the other accessories — mobile phone, carry case, printer and battery.

At the time of writing, the mobile office came standard with loads and loads of cabling. It rapidly becomes apparent that this is its Achilles heel. The cabling provided some problems during testing, and at one stage no power was delivered to the notebook from the external battery. However, this proved to be an intermittent problem, and was inherent to this particular setup. Spectrum has assured us that there is a new suitcase under development, and this should have the cabling hidden within the walls of the carry case.

The external battery pack was only recently introduced, and this is made clear by the problems we experienced. These were all minor problems found solely inside the walls of our office. The most irritating aspect experienced was when we tried to turn on the mobile phone and recharge all batteries simultaneously. The easiest, and most obvious solution to this is not to use the mobile — use the office phone. However, for those of you who could not even contemplate existence without the security of a mobile, you can solve this by charging the notebook from a separate power pack (such as the original power supply unit).

In the real world outside the office, the mobile office performed quite well, and did not provide any problems. Transmitting mail and faxes on the go proved to be very easy, but typing proved to be more of

a challenge. When opened, it took up quite a bit of room, and it would be more comfortable to perform any tasks from a spacious vehicle, or from the boot.

In terms of functionality, the mobile office achieves what its creators set out to do. The main limitations are that you may experience a dropout with the mobile phone. Some users may find that constant removal and replacement of the mobile phone becomes too much of a hassle. Spectrum expects that users will want to purchase a second mobile phone, using one exclusively for voice, and another for data.

There are a few optional items for the mobile office, one of which is a portable printer. Spectrum has chosen the Citizen Notebook II printer to be their standard offering.

However if the portable printer is purchased, you will need to place the external battery in the briefcase section of the carry case. Other options are Nickel Metal Hydride batteries (Nickel Cadmium batteries are standard), external batteries, a car cigarette adaptor, desktop battery charger and docking station.

Overall, we had relatively few difficulties with the system, and those we did experience were fairly minor. Spectrum will supply the whole office system, and set it up all ready to go. It was very easy to use, and accomplished tasks without any hassles.

The cost of the system may be expensive to some, but it is certainly not prohibitive, and it will offer a great deal of flexibility to the modern travelling salesperson.

Kenneth Loui

Spectrum Mobile Office

Distributor: Spectrum Cellular Pty Ltd
Phone: Melbourne (03) 818 4939. Sydney (02) 809 6095

Price: Spectrum Universe 486 DX2/66MHz Mono LCD with 8M RAM (4M RAM expansion), two Nickel-Hydrate batteries, deluxe leather mobile office carry case, Universe car adaptor and four hour battery pack, NEC P3 cellular phone, 14.4Kbps XcellLink Data and Fax PCMCIA modem, Xcell unit for NEC P3, and a Mastercard three year parts and labour warranty \$5695.

In short: The Spectrum Universe mobile office is still in the early stages of life, but can offer a functional mobile office to those who truly need it.

TRUE MULTI-MEDIA NOTEBOOK

Built-in Multi-Media System - Totally Modular - Fully Upgradable

With all of the fantastic features of the Microscience WinBook now you can have a totally built-in Multi-Media system right inside your notebook computer.

The Multi-Media WinBook has:

- ❑ Built in Stereo Speakers
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- ❑ Video Capture Card (opt)
- ❑ IMB VLB Video Card
- ❑ SCSI CD-ROM Adapter (opt)

Make powerful and compelling presentations wherever you are - anyplace, anytime, no hooking up speakers, nothing to plug in - just turn it on and away you go with dazzling colour displays with full sound capabilities. It really is fantastic.

There are ports for external monitor and speakers for maximum theatre impact.

The Microscience Multi-Media WinBook system will just blow you away, yet is just 44mm high and weighs just 2.7kg.

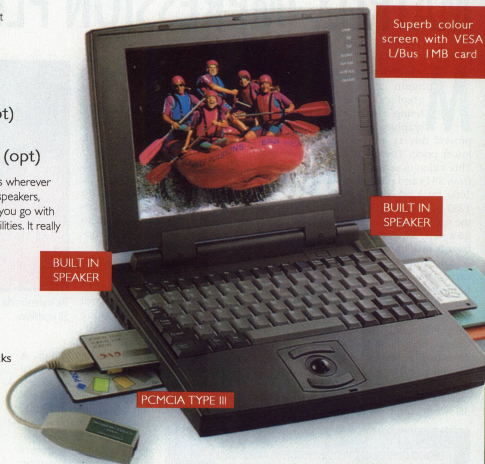
Standard Features Include:

- ❑ MIC, earphone and telephone jacks
- ❑ Bigger & Better Trackball
- ❑ Parallel & Serial Port
- ❑ External Keyboard Port
- ❑ External Colour Monitor Port
- ❑ Docking Station Port

CPU options range from 486SX-25 to the awesome 486DX4-100.

And being fully modular, the keyboard, trackball, RAM card FDD and HDD are removable, and you can upgrade anytime you need.

Even the screen is interchangeable.



Superb colour screen with VESA L/Bus IMB card

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INTERNAL SCSI ADAPTER FOR A CD-ROM



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VIDEO CAPTURE CARD

With the superb technology of the optional Video Capture Unit your Multi-Media WinBook into the ultimate Multi Media tool. You can plug in a VCR or normal video camera, capture an image, store it, and use it in any way you wish.

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MATROX IMPRESSION PLUS

Matrox Graphics Systems is once again raising the bar in the graphics accelerator game by offering a redesign of their MGA graphics engine, along with improved drivers and more features, at a lower price. The 64-bit MGA Impression Plus video accelerator boards are priced from \$943 and offer resolutions as high as 1600 by 1200 with 65,000 colours, and 1280 by 1024 with 24-bit true colour. But the real story is that these PCI-based cards go a step further than ordinary accelerator boards with built-in 3D support.

The Impression Plus' 3D graphics capabilities include gouraud shading, Z-buffering, and double-buffering. In the past, these features appealed only to CAD users, but with Windows image programs such as CorelDRAW, Visual Reality, and Caligari providing 3D drawing tools, Impression Plus should be a hit with desktop illustrators. The CD-ROM that's provided with the board includes a 3D developer's toolkit that will help you to get started with 3D work. Impression Plus provides ap-

sion Plus to operate at an 80MHz refresh rate at 1600 by 1200 resolution.

Memory can be added via a daughtercard, so all 2M cards can be upgraded to high resolution and full-colour depth. Matrox is planning to release other add-ons later this year, including a video playback card, a video encoder — allowing output to video tape — and a video capture board.

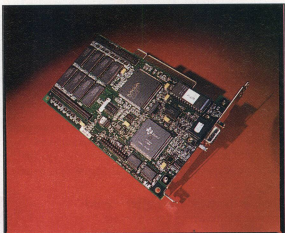
Like the Impression and the Ultima Plus, Impression Plus offers on-the-fly mode-switching of both resolution and pixel depth without exiting Windows. The card has a virtual desktop feature with hardware pan and zoom capabilities. A pan lock limits scrolling of the virtual desktop and automatically centres dialog boxes in the visible area, and a MaxView feature fills the area with the currently selected window.

Installing the Impression Plus in a Micronics 90MHz Pentium system was easy and hassle-free. We snapped the card into a free slot, booted Windows in VGA mode, and then ran the setup utility. The drivers were loaded, a new program group with the video card's controls was created, and we were offered the ability to select the default operating resolution and mode.

Tuning the card for your monitor can improve performance. We paired the Impression Plus with a

NEC 5FGp display and were able to access all resolutions, including 1600 by 1200 resolution at 16-bit colour. Novices can choose a defined monitor type, and power users can tweak virtually any setting. Fine-tuning is handled with an interactive test screen that allows you to resize and position the image, and to interactively tweak the refresh rate.

The Impression Plus's performance in the Winmark test was in line with other 64-bit video engines: 37.8 millions of



The Impression Plus combines high-end Windows performance with 3D capabilities

pixels per second operating at 1024 by 768 resolution with 4M of VRAM in 8-bit mode, and 27.5 millions of pixels per second for the same resolution in 24-bit mode.

One of the few complaints we have had about the Matrox's MGA series is its dismal DOS video score. The Impression Plus does nothing to address this complaint: its score of 494 on our DOS video test lags behind other video cards in its class. On the other hand, most people will buy this card for Windows use. Game players will appreciate the combination of Matrox's video chip and its drivers. We used the Impression Plus with DOOM! and doubled the resolution from 320 by 240 to 640 by 480 without any increase in flicker.

Throughout our testing, mode-switching was clean, with only a momentary jump in the image. Unfortunately, there was a strange line in the opening Windows logo, but we encountered no problems during actual Windows operation.

Matrox plans to follow up the PCI-based Impression Plus with VL-Bus and ISA versions.

James Karney

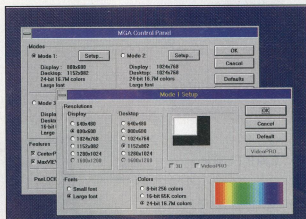
Matrox Impression Plus

Distributor: TCG

Phone: (02) 698 5000

Price: \$943

In short: If you're looking to get the most out of Windows, the Impression Plus is as good as it gets. Almost all 64-bit engines offer comparable 2D performance, but for now, only Matrox offers 3D with all the extras.



Auto-setup: Setup with popular monitors is quick and easy

plication support for Microsoft's Open GL, AutoDesk HOOPS, and VESA VAGI 3-D libraries. Also included are a games sample pack and NT, OS/2, and DynamView DAC drivers.

The Impression Plus is available in both 2M and 4M VRAM versions that offer 24-bit colour resolutions up to 800 by 600 and 1600 by 1200 respectively. In addition, Matrox offers a choice of either a 170MHz or a 220MHz digital-to-analog converter (DAC). The faster DAC allows the Impres-



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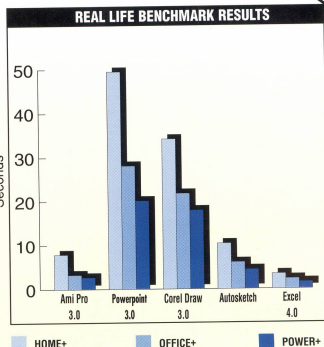
The Best Processor

Designating a computers likely power by the selection of a CPU type and speed is not very sensible. All systems containing either a 486 or Pentium™ chip do not produce the same level of performance. In fact, apparently 'similar' systems can vary by up to 300% in deliverable power on software applications.

The amount of useability you will get from the CPU in your computer system is determined by the effectiveness of the CPU control chipset that links the CPU to the bus, cache and direct memory and the quality of the firmware (BIOS) that controls the instruction paths.

OSBORNE computer systems use highly optimised ASIC's (Application Specific Integrated Circuits) that have been developed and refined over many years to control and optimise the power of the CPU. Similarly **OSBORNE** uses a highly optimised version of a Phoenix developed BIOS to control the CPU subsystem.

The result of these years of development (we do not use 'off the shelf' components) is that your **OSBORNE** X86 or PXX will deliver more of it's available power than other products on the Australian market.



*Real Life Benchmarks display the time taken to perform a wide variety of tasks on 5 of the most commonly used packages.

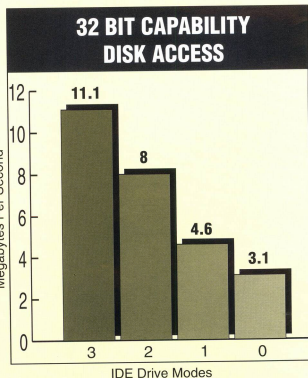
The Best Disk Access

All the main hard disk manufacturers make similarly performing disk drives in terms of their rotational delay and physical access times. The difference in the 'quality' of drives made by the major manufacturers is, virtually, undetectable and the difference in failure rates and times between different brands is almost non existent.

However the difference in performance as measured by the speed at which data on the hard drive can be made available to the CPU for processing can be up to 10 times faster depending on the type of drive controller on the drive and the capability of the disk control chipset on the motherboard of the computer system. The amount of cache on the disk drive itself can also be a factor.

OSBORNE computer systems only use Mode 3 hard drives which as can be seen from the chart opposite provide you with transfer speeds of up to 11mb/sec. We also use the latest CMD disk control chipset which includes the control of Logical Block Addressing and conforms to the new Enhanced IDE specification.

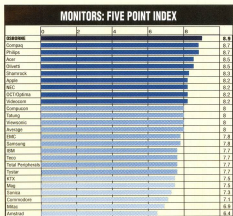
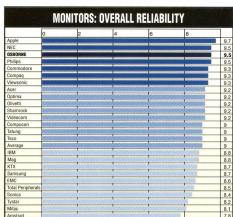
When you select an **OSBORNE** computer system your data will move to and from your hard drive as fast as current technology makes possible and up to three times faster than most other systems on the Australian market.



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OSBORNE
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The Best Monitor



OSBORNE have worked for many years with the worlds leading monitor manufacturers to design a monitor that exactly suits Australia's very different ambient light and magnetic field conditions.

The results of this research work can be seen in the results of the latest survey on user satisfaction with monitors conducted by Australian Personal Computer Magazine and reproduced opposite. Although Philips is one of our monitor suppliers the **OSBORNE** variations on the original Philips design improve the performance of the unit.

Similarly we have worked with MAG Electronics to modify their design to work much better in Australia and by using better quality components than in the original specification we are able to significantly outperform the generic MAG unit.

The buzzwords such as SVGA/Non interlaced/at least 72MHz/Green/MPRII etc, have very little meaning in determining the quality of a display monitor. All but the very poorest quality monitors could, probably, be described by those buzzwords and yet the size, quality and linearity of the displayed images vary enormously.

OSBORNE monitors incorporate the latest 15" flat/square tube and are fully digitally controlled (digital controls give a much more precise image than is possible using analogue controls). The tube and yoke have been manufactured for the Southern Hemisphere magnetic fields and the 'colour' selection has been modified to take into consideration the much brighter ambient light conditions of the Australian continent.

When you purchase an **OSBORNE** computer system the monitor you receive is exactly balanced to ensure that your systems overall power is fully useable by you and the effects of eyestrain are considerably reduced.

The Best Video Chipset

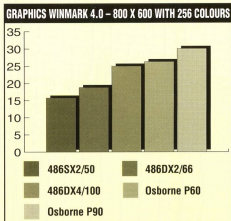
An excellent monitor is a key requirement for the display of your data but an equivalently excellent video control chipset is just as important for you not to be constantly held up waiting for the results of your work to be displayed.

OSBORNE Gold Series computer systems use the very latest, and the very fastest video control chipsets available. The three Gold Series Intel 80486 systems use the new 64 bit version of ATI's Mach Series of controllers that, collectively, have won over 30 Editor's Choice and Best Performance awards in the USA over the past 2 years.

The use of a 64 bit data path between the controller and your monitor display allows data to be transferred at up to 3 times the speed of old 32 bit technology. ATI's firmware and software drivers remain at the forefront of video technology and the ATI Mach 64 chipset used in Gold Series VESA (2) systems provide the fastest video available on any 80486 system.

On **OSBORNE** systems containing Pentium™ microprocessors, (both 60MHz and 90MHz) Diamond System's latest 64 bit Stealth card is integrated with the latest version of the PCI bus to optimise the speed of the Pentium microprocessor. On these systems we use 2 megabytes of dedicated video memory to allow the Pentium microprocessor to communicate at its optimum transfer rate to the video controller.

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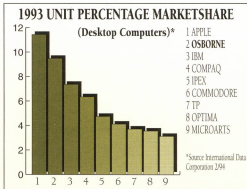
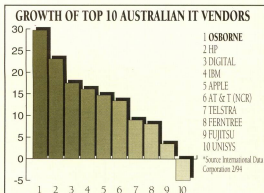
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OSBORNE Micro Computers are bought by more business users in Australia than any other brand. **OSBORNE** computer systems are chosen by a rapidly increasing number of businesses, both very large and very small which has resulted in **OSBORNE**, as a company, growing faster than all other major computer suppliers in Australia.

As can be seen from the two charts **OSBORNE** is now the 10th largest computer company in Australia but it is growing faster than all of the nine bigger companies in the 'Top Ten'.

OSBORNE is also the largest supplier of personal computers that use the DOS/Windows operating system in Australia; a position that it has maintained for the past 2 years.



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There are over 250,000 **OSBORNE** computer systems in use around Australia and the overwhelming majority of those users (over 95%) have bought subsequent systems from us following their initial purchase.

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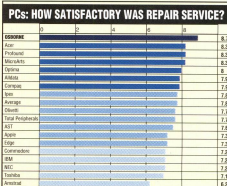
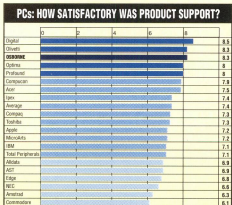
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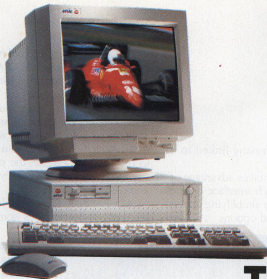


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This graphics accelerator offers spectacular performance with Winmark 4.0 at 22.5M and up to 1280 x 1024, 256 colours or 800 x 600, 16M colours.

*Includes

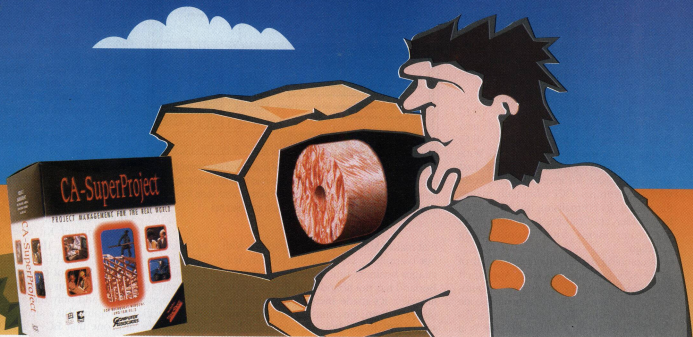
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VISUAL C++ 2.0 & BORLAND C++ 4.5

With their newest C++ products, Borland and Microsoft have taken two fundamentally different approaches: Microsoft emphasises cross-platform coverage and the ability to create OLE custom controls, while Borland introduces a highly modular set of OLE 2.0 tools.

In a major strategy reversal, Borland is ceding the battle for definition of a de facto C++ Windows API to Microsoft's MFC (Microsoft Foundation Classes) while taking the lead in OLE 2.0 applications development tools with Borland C++ 4.5. BC++ 4.5 delivers OLE 2.0 component support that is independent of a specific applications framework, tools that retrofit existing code with OLE functionality, and support for fast, DLL-based OLE servers.

Borland's new OCF (Object Component Framework) lets you write OLE-enabled applications that plug cleanly into OWL (Object Windows Library), MFC, straight C++, and even ordinary C Windows programs — thus offering the first incremental path for investing older code with OLE features. OCF essentially makes the model. Its normalising mechanism allows older applications to benefit from OLE components without undergoing redesign.

A unique and complementary strength of BC++ 4.5's OCF tool set is its AppExpert source code generator. AppExpert can automatically update previously generated code with OLE support. By contrast, Microsoft's AppWizard source code generator is a single-pass utility that establishes for all time

the class library support built into the application templates it creates.

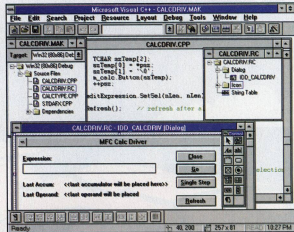
BC++ 4.5's compiler will reportedly include an MFC compatibility layer. The precise extent of MFC support has not been defined, but Borland says it will be thorough. "We will give developers a path

supply separate DLLs for each international language that they want to support. A VBX can map its property list to alias tables that translate the property names to various languages so that a VBX can change languages dynamically.

With Visual C++ 2.0, Microsoft has crafted a masterful product by improving its IDE, expanding its class library, and targeting multiple hardware platforms. Visual C++ 2.0's 32-bit MFC library is source code-portable across the Intel, Mips RISC 4000, DEC Alpha and Mac platforms. The new 32-bit MFC libraries are thread safe, exploiting one of the more sophisticated operating-system features of NT. MFC functions can be called from multiple threads, with the library offering a C-WinThread class for creating new threads.

Visual C++ 2.0's most dramatic technical achievement is the OLE Custom Control Development Kit. The OLE Custom Control Development Kit does for custom controls what the Visual Workbench did for MFC: It leads developers through a set of choices and generates extensive skeleton code, leaving the programmer to add only the application-specific behaviour. This is an enabling technology, and one that BC++ 4.5 OLE tools don't address.

Nancy Nicolaisen



Visual C++ 2.0 features a seamlessly integrated development environment that minimises the number of steps needed to create visual interface elements and link them to handle code. Pictured is the new project window, which opens the appropriate editor when you click on a filename in the project tree

that makes MFC relatively easy to use with our compiler," says Michael Hyman, languages business-unit manager at Borland. Borland has not abandoned its OWL-class libraries; it's made incremental improvements in them, the compiler back end, and some IDE tools. But the recurrent harmonic of the BC++4.5 theme is OLE 2.0.

In another daring move, Borland will introduce a 32-bit portability layer that lets 32-bit Windows applications use 16-bit Visual Basic controls under Chicago and Windows NT. This is good news to the developers of Windows 3.1 applications that rely on VBXs (Visual Basic custom controls), an inherently 16-bit technology; this support is not forthcoming from Microsoft.

A novel feature of BC++4.5 is internationalisation of the VBX property list, which eliminates the need for developers to

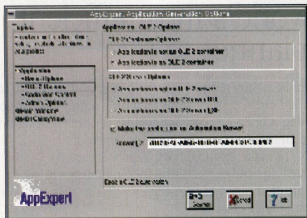
Borland C++ 4.5
Distributor: Borland
Phone: (02) 911 1000
Price: Not available at the time of going to press.

In short: Borland C++ 4.5 takes the lead in application development tools. This will make a lot of developers' lives easier.

Microsoft Visual C++ 2.0
Distributor: Microsoft
Phone: (02) 870 2200

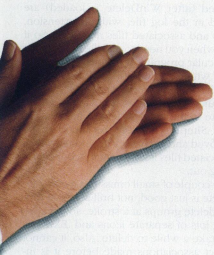
Price: Approximately \$850. Product released early to mid-November

In short: Visual C++ 2.0 is an excellent environment. Microsoft has improved the IDE and expanded the class library. The product is targeted at multiple hardware platforms.



Using the Borland C++ AppExpert, you can create an OLE 2.0-enabled application by simply choosing the OLE 2.0 options provided. Borland's OLE 2.0 support also makes it easy to OLE-enable existing applications

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Z-PLAYER AND WINDELETE

Z-PLAYER

Taking CD-ROMs on the road with a portable PC is very attractive. Multimedia demonstrations, interactive software shows and database access are all simple and effective; more so for being on a customer's home ground.



The Z-Player is a subnotebook-size add-on CD-ROM drive that links into any PCMCIA Type II slot

Zenith Data Systems has entered the portable CD fray not with a bulky notebook/player combo unit, but with a clever add-on CD-ROM drive that links into any PCMCIA Type II slot. And not only does it play CD-ROMs, it includes a 16-bit stereo sound card and speakers, and can be used as a standalone audio CD player too. Neat.

The unit is about the same size as most subnotebooks, has the usual flip-up lid over the disk drive, a row of audio play control buttons and a status LCD display on the front. The speakers are built into the bodywork, and give stereo out from either side of the disc. Other controls include volume, line in/out, microphone in and a power switch. There is a compartment for six AA size NiCads or pen cells, but battery life is stated as being 30 to 45 minutes so you can effectively forget Duracell usage. The bundled power supply charges NiCads during use.

Setting up is a doddle. Slot the supplied PCMCIA card into a spare notebook slot, plug the card/player cable into the I/O port on the back of the Z-Player, load the supplied Windows software and start ROMming. The CD-ROM needs to be pushed firmly onto the

drive to lock it into place. This means you can walk around with it playing, without skip and repeat problems.

The bundle comes with a pair of CD ROM samplers (US issue unfortunately) plus a suite of useful audio utilities which give full control over output and input via the unit. This is useful because you can not only play, but record too. And mix line in, microphone (either line or the built-in item), CD audio or WAVs. Very smart. The quality from both CD audio and built-in microphone is surprisingly good, and even though the speakers are small, they would be adequate for most situations.

The drive itself is an MPCII double-spin mechanism, which gives a reasonable 296Kbps transfer speed. No jumping or glitching was noticed on audio tracks, unlike some other multispeed players. No speed overhead was noticed through the use of the PCMCIA interface, in fact it could well be faster at loading large files than some bus-driven ROM drives.

So, apart from the battery life, a very well thought out and useful accessory for the travelling multimedia vendor or remote database operator.

WINDELETE

One of the real bugbears of Windows is its application integration. Unlike DOS, Windows tells all its apps where to look for various libraries, launch parameters, file links, icons, program groups, data files and run specifications across a host of different directories.

Consequently uninstalling any Windows software is much like trying to find a packet of needles which have been spilt in a haystack. Very difficult, slightly dangerous and likely to cause much frustration. A few of the dedicated tools packages offer basic uninstall, and some software will remove itself if you ask. But just generally tidying up the disk, WIN and SYSTEM.INI files is not really enough to justify spending out on Norton Utilities.

IMSI software has spotted a gap in the market for a simple, safe and relatively cheap uninstall package, and released WinDelete. This neat app takes

up just over 500K when loaded from one floppy, and, once in place, monitors all new program activity through a simple log file methodology. Any new programs loaded (after WinDelete is loaded) are listed in the log file, with all extension, links and associated files noted too. So if and when you need to pull the plug on that particular program, WinDelete knows exactly where and what to look for.

The system works very well, with a colour coded (yellow: be careful, green: delete to the max) system of file descriptors. Simply click on the file(s) to be removed and away they go, along with all associated files if you want to scour everything out.

A couple of small omissions mean WinDelete is just good, not brilliant. You cannot delete groups at a stroke, so big apps with lots of separate icons and .EXE files can take a while to delete. Also, it cannot detect associations made before it is installed. This can result in a still-clogged set of .INI files after deleting a highly integrated application. Still, for under \$70, a useful addition to the Windows toolkit.

Jeremy Torr

Z-Player

Distributor: Z-Express

Phone: (02) 417 1522

Price: \$1227

In short: Excellent quality and design, although greedy on batteries.

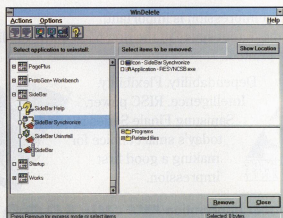
WinDelete

Distributor: IMSI

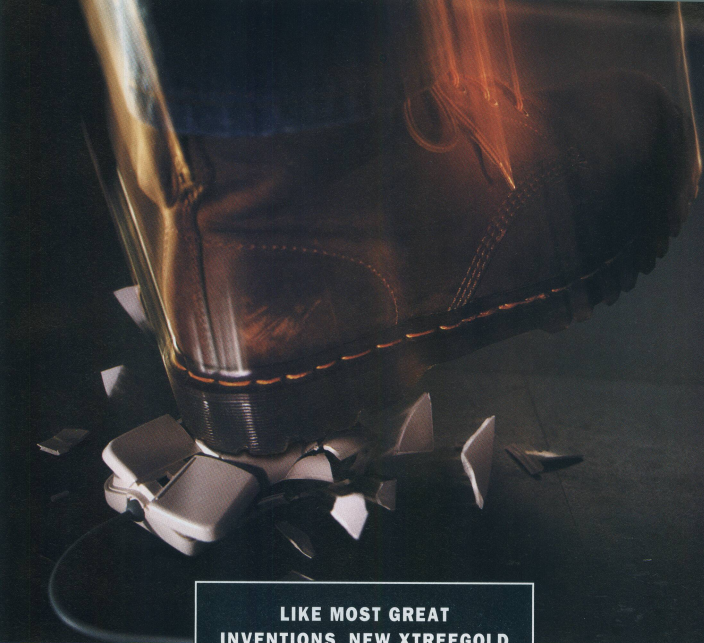
Phone: (02) 319 7524

Price: \$69.95

In short: Serviceable software at a serviceable price.



Click on the file to be removed and WinDelete removes it and all associated files




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CENTRAL POINT
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MICROSOFT WING

Sales of DOS-based applications continue to decline, but one area where DOS still rules is in entertainment and games, thanks to performance advantages over Windows' GDI (Graphical Device Interface). The trade group Software Publishers Association says overall DOS applications sales in the US and Canada declined 47.5 per cent to \$235 million for second quarter 1994 compared to the same period in 1993. However, in entertainment software, DOS programs accounted for about 50 per cent of retail sales (\$41.6 million), compared to 33 per cent (\$27.4 million) for Windows, with the Mac commanding the remaining 21 per cent (\$18 million). As long as game developers stick with DOS for superior performance, they will impede Microsoft's efforts to move the industry to Windows95, Windows NT, and Win32. But many game developers see DOS' games domination ending thanks to WinG (pronounced 'Win Gee').

WinG is a new library of graphics routines from Microsoft that lets developers significantly boost the performance of graphics-intensive Windows applications. Distributed free with new Windows software and built into Windows95 and NT 3.5, WinG accelerates screen updates and delivers almost as much speed as custom graphics routines in MS-DOS programs do. Although it won't make existing Windows applications run faster, new software (and updates of current software) designed to take advantage of WinG should begin appearing late this year.

Microsoft unveiled WinG at the Computer Game Developers Conference in Silicon Valley last April. To show off the library's capabilities, Microsoft demonstrated a prototype Windows version of DOOM, a popular DOS-based game from id Software. Soon afterward, Microsoft posted beta versions of WinG in a developer's forum on CompuServe.

Any Windows program that needs fast screen updates or smooth panning can benefit from WinG. But Microsoft's primary target is the game market. Most game developers have been forced to write for DOS, because the Windows GDI is notoriously slow. DOS programmers can write optimised routines that directly access the computer's graphics hardware.

Unfortunately, the higher performance of DOS comes at a price. Without a DOS extender, DOS programs are limited to conven-

tional memory (the address below 1M). They also lack the device independence of well-behaved Windows programs and often require users to modify their CONFIG.SYS and AUTOEXEC.BAT files during installation, which results in more customer-support calls. Game developers are weary of these headaches but were unwilling to sacrifice performance.

For the most part, WinG works by circumventing some limitations of the GDI, which was designed for static displays rather than animation. To achieve device independence, the GDI shields Windows programmers from hardware-specific

which developers had to do prior to WinG. Also, programmers can draw graphics directly onto the WinGDC bit map with GDI routines or their own custom routines. When the screen is ready to be displayed, WinG provides two new calls (**WinGBitBlt** and **WinGStretchBlt**) that can copy the WinGDC into the display CD much faster than the GDI's **BitBlt** and **StretchBlt** can.

As a final bonus, WinG also tests the system it's installed on to determine which combination of GDI and WinG calls yields the fastest performance, because there is some variation among graphics cards from



Game developers plan on releasing WinG-based entertainment programs in time for the holiday season

details of output devices (including graphics cards and printers) by interposing a logical drawing surface known as a DC (device context). In other words, instead of drawing directly into the physical frame buffer (screen memory) of the graphics card, Windows programmers use the device-independent display DC. The GDI and Windows device drivers handle the details of translating those logical graphics into physical graphics in the frame buffer.

Drawing graphics on the fly with GDI routines is not practical for animation, so many Windows programs use a technique called double buffering. But this technique is too slow for smooth animation.

WinG introduces a streamlined approach. First, it lets programmers create a new type of DC, called a WinGDC, that accepts DIBs (Device Independent Bitmaps) directly. That eliminates the time-consuming steps of shuttling the DIBs through a memory DC and converting them into Device Dependent Bitmaps,

different vendors. It then saves this profile for future reference. There can even be different profiles for each screen mode. For example, a 640 by 480 pixel resolution screen with 16-bit RGB colour may require different techniques than a 320 by 200 pixel resolution screen with 8-bit index colour. WinG handles this automatically.

Nels Bruckner, a software engineer at Dynamix says he's using WinG for future projects. He says WinG is definitely faster than the GDI at updating smaller windows and is particularly useful for simulating sprites.

Tom Halfhill

Microsoft WinG
Distributor: Microsoft
Phone: (02) 870 2200
Price: Distributed free with Chicago and NT.

In short: WinG will let developers significantly boost the performance of graphics-intensive Windows applications.

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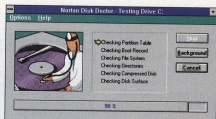
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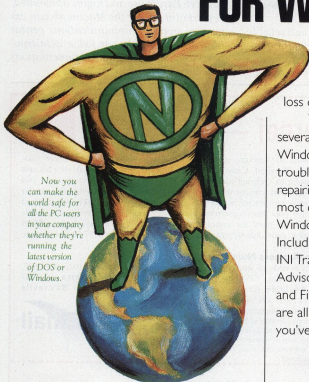


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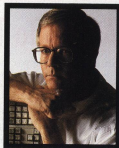
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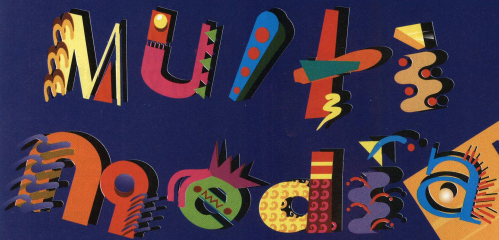
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In the meantime, Intel cut design and manufacturing costs by converting the clunky motherboard-daughtercard combination into a single half-length card featuring a 64-bit 25/50MHz i750 RISC engine.

In addition, the SVR has an upgraded Indeo compression algorithm and the latest Philips analog-to-digital front-end. Like the old board, the SVR features composite and S-Video connectors and accepts both NTSC and PAL video input.

The SVR was able to capture 30 frames per second (fps) of video at a resolution of 320-by-240 in Indeo 3.2 compressed format on a PCI-based AST Premia 90MHz Pentium system. However, on a Gateway 486DX2/66 VL-Bus PC, the SVR dropped frames at 30fps capture, but managed 15fps without a problem. Since 15fps is the most common software-only compression frame rate, the SVR's capture performance was adequate for most applications.

Overall, the video quality was excellent, the realistic colour contrast and fine detail a clear improvement over the output of the older product. This reflects the quality of the new Philips 7196 encoder-chip and the increased compression performance.

An added bonus is the inclusion of Asymetrix's Digital Video Producer (DVP) software, which provides both video capture and video editing functions. As a video editor, DVP excels at making common video-editing tasks accessible. Even a beginner should quickly be able to learn to create transitions between clips and compress to final output.

Jan Ozer

Distributor: Dimension Graphics

Phone: (02) 929 5855

Price: \$1473

In short: With the SVR, Intel improved both video quality and capture performance and assembled a software-hardware combination that's at once full-featured and accessible. The result is a high-quality, inexpensive, and easy-to-use digital video production suite that is just as suitable for beginners as for professionals.

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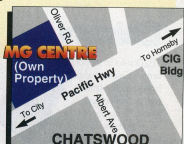
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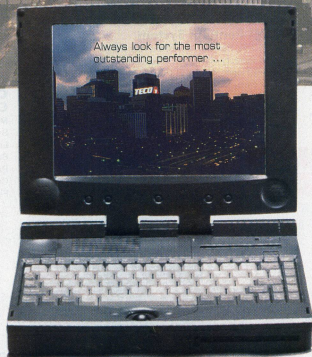


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A bright silicon future

People will buy more computers this Christmas than ever before. So far I haven't found anyone who disagrees with this statement. It is obvious why. We have just come out of a recession that certainly rocked that nebulous entity 'consumer confidence'. At the same time, the prices of PCs are lower than they have ever been and the small office/home office market is already the fastest expanding part of the business. Add a dash of the Christmas spending spree to this environment and you get the best time for selling computers ever.

In the US, current estimates are that about 35 per cent of homes have a computer. In Australia it is probably more like 25 per cent. The remaining 65 or 75 per cent is the largest untapped market in the US or Australia. The PC manufacturers make the most of this.

So you will see more innovative packaging in the next few months. Compaq is planning to launch a PC that combines TV, computing and telephony in the one package by Christmas. While I don't think that Compaq will get such a device on sale here in that time frame — the technical obstacles are just too high — this is the sort of thing we can look forward to.

If you can save the cost of a new TV set when you buy a PC, then the price is not as critical an issue. The purchase is easier to justify. If you get a telephone and answering machine as well then you are doing even better.

The press often makes a dog's breakfast of social change. Important changes are either ignored completely or so hyped up that the reality disappears under the weight of verbiage.

With that caveat in mind, let me say that this spurt in PC ownership is part of an important social change. That change is built out of two things: the relentless improvements in computer and communications technology and the basic human impulse to communicate.

I am not suggesting that people are buying these PCs to communicate. Of course people's motivation is very varied. They buy machines because they need them for their work, or because they fear that their kids are falling behind in computer literacy or because they want to play games on them or just because everyone else is buying one.

These new users will take their PCs home and unpack them and set them up. Some will find them easy to use and others will get discouraged and leave the PC gathering dust. Some will become very enthusiastic and will go out and buy other software and hardware for their PC.

Some will buy modems and go out and investigate the online world. In fact, if you plot modem sales against PC sales you will see that modem sales are increasing at a much faster rate than PC sales. More and more PCs have modems.

Even though computer retailers will have the best Christmas ever, this sales surge will at the very most add a single percentage point to the numbers of households with computers in Australia. Of that, only a few will become enthusiastic members of the online world. The idea I am trying to get across here is the slow building of momentum behind the communications side of the PC.

What I have found is that once someone becomes part of that world they never withdraw. It may take a long time for them to become enthusiastic and comfortable with every part of the online world, but they will get there in the end. If they are put off by the cost, they will almost certainly come back later once prices come down.

You see, we all love to communicate. The Internet, bulletin boards, CompuServe, Delphi and any other online service provide a whole new way to communicate. Better still, they provide a way to find those people who have the same interests as you and communicate with them.▲

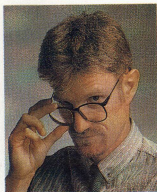


BY JEREMY HOREY

Christmas sales will push up PC ownership, and combine with telecoms innovation to drive a slow but powerful momentum in PC communications.



Voice in the machine



BY JEREMY TORR

*One of the most
heralded, longest
awaited and least
available PC
technologies around
today must be voice
capability.*

Disabled mathematician Steven Hawking uses it to help him communicate and Kurzweil developed a reading machine that would do for blind people what eyes and voices do for sighted readers. But all these examples are far from the ideals preached by our sci-fi prophets. Full voice capability really isn't with us yet, despite what the marketers tell us.

Even if it was easy, I reckon we should give up on it. What's the point? We all know how much time we can waste on the phone—speech recognition and voice mail simply duplicate that time-wasting on the computer instead. You know how people ramble on when they are leaving a message on your answering service? They'll do the same with voice systems, believe me. You'll soon have a server clogged full of ummms and ahhs.

Those simple scribbled memos would become monster (OK, so the boffins are working on compression to make them smaller, but they are still big) WAV or VOC files. Even if the super smart voice recognition software you have bought has translated it into ASCII, you'll still have to keep the original to make sure the translation is accurate. So all that happens is twice as much disk space gets used up and the boss gets a feeling of being on the cutting edge. Blunt edge more like.

Sure, there are examples such as Creative's Voice Assist and IBM's dictation engine—as supplied by Osborne and the subject of some pretty surreal adverts on late night TV. But in the main, the translation of sound to ASCII is proving remarkably difficult.

With text you can search, check, replace and reformat because there is a common format. Tell me where the common format is in speech and I'll prove you wrong. The gentleman from Scotland and the Deep South hotel madam speak the same language, nominally, but they have as much chance of holding a fluent conversation as Alexander Downer does of suddenly becoming popular. Even if both parties have the best on-board translation and inference computer in our known universe; I hope you begin to see what I mean.

Because of the enormous variation in timbre, pitch and volume of the human voice it is very difficult to generate general rules which apply to speech patterns and modes. The way words and inflections are used to insinuate meaning is also important in speech interactions with other humans. A computer would be hard pressed to tell the difference between "Well?" and "Well!". Even print does that better.

The whole idea of computers being useful to us is based on their being a fast, effective and accurate way to store and communicate data. Start asking a computer to make approximate decisions about an inflection, a dialect or a speech impediment and it would waste more time than you could imagine.

The problem is that computers are useful in their ability to search rapidly, but not in deciding where to look. Humans are not good at knowing everything, but are good at knowing the best probable places to look for answers. We can guess, computers can't. Informed reports indicate it's likely universal speech recognition technology will proceed in the direction of expert rules, not inference engines. This means enormous amounts of computing power will be needed to search vast databases for all the different ways humans can say "If". What a waste, even if investing millions in developing the best voice recognition system ever results in finding it doesn't work with French or Mandarin.

Personally, I couldn't gif a Monkeys. Sea what eye mene?▲



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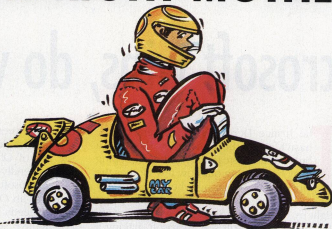
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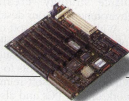
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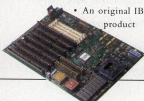
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When Microsoft wins, do we lose?



BY JIM SEYMOUR

After the US Justice Department concluded its inquisition of Microsoft during winter and declared that Gates & Co. will now be as pure as the driven silicon (via the magic of a consent decree), I thought the Microsoft World Domination Conspiracy theorists might take a break.

The Justice Department's consent decree hasn't given the conspiracy theorists a break at all. Instead they've been keeping busy by pointing out how few clothes the emperor was wearing when the Attorney General assured everyone things had been set aright by Justice's Big Sit-Down with Microsoft. The theorists also still see Microsoft making a play for global dominion with a 'DOS and Windows *uber alles*' policy. And I think they're missing the boat.

If that has them worried — and you worried — then let me spoil your day and tell you of Microsoft's real threat: a back-door attack through Microsoft Office.

Microsoft Office is already the dominant player in the software-suite business, with an 80 per cent market share. Lotus and Novell/WordPerfect understandably wouldn't agree with me on this, but I think that huge share owes as much to merit as it does to Microsoft's marketing clout. The individual apps in Office are, to my eye, the performance leaders in their categories, and their integration is superb.

For every time I curse OLE 2.0's bloat and consumption of system resources, 10 other times I bless it as I drag things from one app's document to another, or as I edit in place, a feature which really has made my life at the computer easier.

Microsoft Office began as a loose affiliation of similar products, then moved in its second phase to this high level of cohesion and cross-application integration, which truly makes it a suite. Several months ago, the appearance of Visio Express, an Office add-in from Shapeware, marked the beginning of the third phase of the Office strategy: creating an 'MS Office environment' on our desktops.

With DOS, Microsoft owned the underlying software grid that controlled our PCs.

With its early apps, such as Word, Microsoft began to give us tools to do useful work. With Windows, Microsoft reinvented the context of work on our PCs and also cracked the market dominance of the former DOS-era applications champs, Lotus and WordPerfect.

That past was but prologue. With its Office-environment strategy, Microsoft now wants to move us to a cosy, does-it-all world in which it offers the key tools. Microsoft is perfectly happy to let cooperative third-party software developers, ready to dance to its tune, fill in those pesky little

cracks between Office applications. Indeed, the role of those developers is critical here. Expect to see lots of Office add-ins — oops, make that Office-friendly apps — within the next year.

If Microsoft insulates PC users within the safe space of an Office environment, the company hardly needs to worry about new releases of competitive suites or standalone applications: We'll never see them. So what if AmiPro makes a big leap forward, or Paradox finally tames the last demons of database management? As long as Microsoft keeps users happy within that Office world, users won't be tempted to look out the (oops, sorry) windows.

Just keep shipping 'em those nice, profitable Office upgrades. And, yeh yes, give those ISVs developing Office add-ins nice shiny seals of approval they can slap on their boxes, as long as they keep in line.

Novell/WordPerfect hasn't missed this point, striking back, of course, with its PerfectSolutions response: add-ins for its own suite, intended to accomplish exactly the same results. Some third-party developers play all three sides of the suite triangle. Shapeware, for example, has already moved Visio Express into Lotus's SmartSuite; we can also expect to see a version for WordPerfect's suite soon.

There's an IBM term for such product management, almost a mantra during Big Blue's glory days in the 1950s and 1960's: *account control*.

There's one thing wrong with my casting this plot as a smarmy scheme for dominance. Microsoft isn't the only winner. You and I are winners, too.

Users are the big winners when Microsoft adds new functions to an operating system, GUI environment, or applications suite. We'll see that once again early next year, for example, when Chicago/Windows 4.0 appears with very good faxing and email capabilities built in.

Inevitably, however, other software vendors lose ground when one company cleans up in the market. So they turn to the Justice Department. Others — for example, Delrina, which upon seeing the decline of the PC fax market it had dominated, set out to recast itself as a sophisticated communication services provider — smell the coffee and move on.

I hope Washington doesn't try to squelch that survival instinct — even if squelching it deeply satisfies the conspiracy folks. ▲

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Readers' say

Gone with the games

What has happened to the Games review in *After Hours*? In the last few issues, we've been lucky to get one or two reviews—and in October, we got a screen saver! I'm not the only "serious user" who'll add to sneaking a peak at the odd game or two (Doom live on!). So let's get the good reviews happening again.

Regarding the defence of OS/2—it's a great piece of software, but let's face it, the majority of us are waiting for Windows95. The only thing IBM has on their side is time. If we have to wait for Windows95 for anything like the time we have to wait for an upgrade from Microsoft, I may no longer be young and will have to resort to OS/2 version 7!

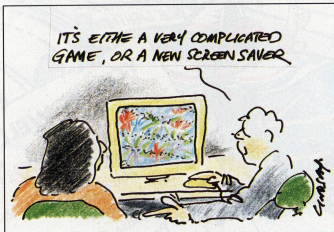
Ben Dailey
via Oz-Email

Games are back. Sorry we strayed—Ed.

Fast workers

Over the last several years, I have become a regular reader of your fine magazine, and recently a subscriber. However, after reading the Fast Workers article in *APC* August 1994, I feel compelled to comment on what appears to be either "glaring errors" or just a plain misunderstanding of what was being tested.

Firstly, in the review of the Maestro Executive modem (although no speed is tested, the price quoted is the RRP for the Executive 288 FM). I am the current proud owner of a Maestro 144 FM, as well as one of its bigger brothers (the 288FM), and think that the



modem tested has been dealt a rather unfair blow. Saying that the provision of a 25 to 25 pin cable without an adaptor is a negative feature is harsh, to say the least. Although I have no data with which to back this up, in my experience most users have their 9-pin mouse using COM1, and the 25 pin COM2 gets used for the modem.

In the article you also mention that "despite calls being logged at 14,400bps, not 19,200bps" and then go on in the same sentence to say "one of these recorded a scorching 762cps transfer rate". If you are expecting a modem to log calls at 19,200bps, you should surely expect a cps rate close to 1900cps.

Secondly, in the review of the Hayes Optima 144 Fax-modem, you say "It also established solid 26400bps links to the US BBS". Maybe you should have been testing the Hayes Optima 144 instead of the 288? I have called several times overseas to BBSs in both the USA and the UK, and have never had a connect worse than 24,000bps from my Maestro 288, and have on

occassion using Optus' 0019 service, received a good 28,800 connect.

In closing I would like to say that you have a wonderful magazine which I will continue to purchase, however, I felt that the above points should be addressed in the pursuit of providing intending purchasers with more accurate information.

Hugh Woods
Adelaide, SA.

Impressed with Unilock, but...

I am impressed with the Unilock idea used in the disk that came with my *APC* last month, but I must say that the program still has files on it, whether from Unilock (as I suspect) or from the Sidebar program itself.

I installed the version of Sidebar that came with my copy of your mag. I was impressed with the Unilocked version, but annoyed with the messages that came up when I started the program, so I decided to buy it. It was to my great disappointment when I

restarted the now paid for program that another one of those intensely annoying messages came up, asking whether I wanted to make a copy to distribute for points. I admit there are now fewer stupid messages before the program starts, but there is one and that is one too many.

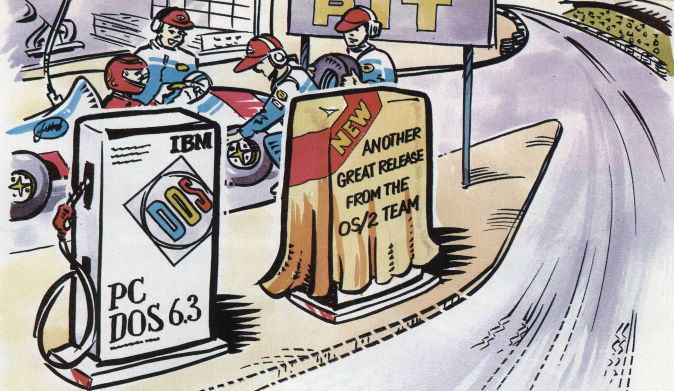
Alex Webling, SA

And unimpressed with Unilock, no buts...

Well done people, two months ago you published an article unjustly accusing Delrina of shipping "crippleware" in the form of WinFax Lite. In August you provide a coverdisk, Sidebar, which really is "crippleware".

What good is providing a package in which the most important features are disabled? How can anyone possibly evaluate the software if it does not work as intended? *APC* should be ashamed to put what is purely an advertising gimmick on its cover, implying that by buying the magazine, the reader gets at least shareware if not freeware. Other magazines distribute working software, with either nag screens, or some ancillary functions disabled. (For example, *PC User* distributed a full version of Claris Works, minus spell checker, thesaurus and manuals.)

The Sidebar product is distributed in much the same way as shareware, however what it really is, is another form of advertising. I don't blame software publishers for this methodology, however it need to be quite clear that this is NOT shareware, or even remotely related to it. In effect this method of distribution



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threatens to bring shareware into disrepute, as many users will see it in the same light.

If this kind of distribution is to become common, then the distributors should do the right thing and make it quite clear that the software is *not* shareware.

Come on APC, lift your game. Don't let the software vendors rip-off the paying public anymore than they already do.

Steve Burr
via CompuServe

Considering the mixed response we received from readers, it will be interesting to see if Unlock takes off as a software distribution method as the pundits predict, or whether this really is "crippleware" and has no future. We hope we've contributed something to the debate by giving readers a chance to argue for themselves — Ed.

Splitting the Dummy

I am a Dummy!

Those books, *DOS for Dummies* and *WordPerfect for Idiots* were written just for me.

This brings me to the point of my letter. There is no doubting the expertise and thoroughness of your writers, unfortunately with me it doesn't always sink in. When I'm sometimes in over my head I think 'Now, how would a Dummy approach this problem?' You see a Dummy 'bumps his nose', 'stubs his toes' quite often and doesn't always see things in a logical, technical, 'right' way — I would like to be able to see some of those bumps beforehand.

What I am suggesting is that some of your reviews have a 'Dummy' slant to them or even a 'Dummy' review. As well as informative I would suggest they could be quite humorous.

Carl Hemberg

Our sister magazine PC User offers a less techie approach to computing, and we hope that between us we can cover most tastes, interests and styles — Ed.

We welcome comments and suggestions. Send

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CD-deals

Leonardo the Demo

APC's first CD-ROM cover disc, from Roadshow New Media and Future Vision, offers readers a chance to taste test some way-cool software, and check out a shopfront of the future, complete with 20 per cent discount.

By Nathaniel Tunbridge

The CD-ROM explosion is under way, and APC hopes to help push it along a little with Australia's first CD-ROM cover disc.

Not that it's likely to need much pushing. A recent TFPL report showed that the number of CD-ROM titles available in Australia had risen from 48 in 1987 to 5379 in 1994. Worldwide, of course, the figure is much higher: over 8000 titles are now available.

IT analysis company IDC estimates sales of CD-ROM players will continue to rise until 1998, by which time there will be annual shipments of over 700,000, and an installed base of well over 2.5 million CD-enabled PCs.

IDC spokesperson Graham Penn indicated that true figures on CD-ROM sales were tough to calculate because the product was reaching the market through three major avenues: over-the-counter sales; in multimedia kits; and OEMs where CD-ROMs are being installed with the original equipment. Despite this, the installed base of CD-ROM drives could be put at 450,000, 70 per cent of which was in the home market. This figure was expected to increase by another 400,000 shipments next year.

The CD-ROM explosion is inextricably tied in with the development of the SoHo market.

"I guess the CD-ROM has become the cheap way into multimedia for the home market," Mr Penn surmised. "You can't quite use the modem to deliver true multimedia into the home at the moment because there isn't the bandwidth or con-

nections in place, so the CD-ROM will be the delivery mechanism for the next three or four years. Beyond that, it depends very much on the charges that will inevitably be placed around accessing the information highway."

CD-ROM does let you deal with multimedia content types now however.

"Mastering the technology is not a trivial exercise," Mr Penn pointed out. "There are a lot of people out there now developing multimedia software in Australia, but to get a decent return on their investment they have to break out of the Australian market and go overseas."

The appeal is not purely consumer-orientated. Specialist databases, such as the Green Pages guide, a demo of which is included on the CD, combine ease of distribution with comprehensive data stores. Corporate businesses are starting to produce their own CD-ROMs containing company information.

CD-ROMs form an ideal stepping stone to online services.

The "Galaxy of Stars" electronic shopping catalogue included on the CD is a good example of the potential of moving the type of content you can place on a CD online. Currently, you can browse through a catalogue of products, listen to the sales pitch, and check out a demo. To buy at the discount rate of 20 per cent off for APC readers, you need to ring the 1-800 number displayed. Once this sort of content moves online, though, you can imagine simply clicking a buy button to purchase, and then downloading the full package online. The Unlock concept we demonstrated with SideBar in August is

another component of such a retailing model.

"Essentially CD-ROMs are an interactive storage medium. Online represents another genre of services entirely," according to Leighton Jenkins from Microsoft. "One of the latest developments is that products are going to be updated daily, whereas a CD-ROM is currently updated only on an annual basis. There are three parameters on which you can judge a medium: storage, interactivity and timeliness. CD-ROM covers the first two well, but not so the last."

Serious CD-ROM doomsayers have a succession of Swiss cheese arguments against the medium. They say that current CD-ROM standards don't allow more than 70 minutes of compressed VHS-quality video on a disc, while claiming that the new magneto-optical drives contain capacities of up to 1.3G and are rewritable. Phillips and Sony are already working together (as are several other companies) on a high-density CD system that will contain 3G on a single disc. With hardware growing smaller by the month, the fairly large size of CD-ROMs is touted by some as an issue, but the all-encompassing wave of miniaturisation will sweep over this removable media along with everything else. Whichever way you look at it, CD-ROMs will continue to make an ideal distribution medium. Until the standard level of bandwidth into people's homes and offices has increased by an order of magnitude over today, it is the only feasible medium for delivering multimedia applications and services. ▲



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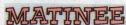
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Your free CD-ROM

Your CD-ROM is divided into two sections: a demonstration of the interactive multimedia presentation *Leonardo the Inventor* and an application called *Galaxy of Stars* that we have included to give you an idea of how software may be bought in the near future.

Leonardo Da Vinci was born in 1452 in Tuscany, and throughout his life made a number of notebooks, recording his musings and ideas. The *Leonardo CD-ROM* brings to life the creative genius of the man, with the power of modern multimedia. His drawings are animated, his inventions operated and his thoughts read aloud. While some of these inventions were built during his lifetime (indeed he earned his living as a civil and military engineer and architect, as well as a painter) many were so far ahead of their time that their construction proved impossible. Some of Leonardo's inventions are present today in virtually unchanged form, such as his two-level bridge and double-hulled ship. In the case of his tank and paddle-wheel ship, the only addition made to his essential idea has been that of an engine. Indeed, seeing the systems of levers, pulleys, weights and counterweights that he used, it's possible to surmise that Leonardo's genius stopped just short of the internal combustion engine. His variable speed drive anticipated the transmission of a modern car, however.

The demonstration version of the *Leonardo CD-ROM* will allow you to get a glimpse into the magnitude of the man's genius. The five areas covered are inventions, biography, time line, works and bibliography. In the case of

Demo CD: Leonardo the Demo and Galaxy of Stars

Highlights of other products available at a 20 per cent discount to APC readers:

InfoPedia: Combines a multimedia encyclopaedia with electronic reference books. The product uses a single screen interface, rather than a windowed approach, and features 60 video clips and 90 animations.

Beethoven's 5th: This product aims to help develop an understanding of classical music through an analysis of Beethoven's life and work. You can explore the symphony itself in detail, with full documentation of its inner workings.

Supersonic: For warheads or just the historically interested, *Supersonic* is a complete guide to modern military aircraft, covering more than 100 aircraft.

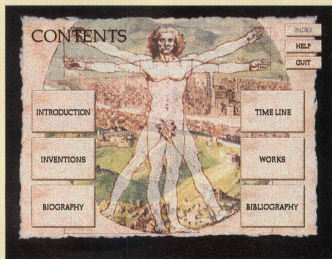
Upside Town: An educational adventure for children, combining puzzles, games and an adventure theme and a children's book feel.

For more information about the products demoed or discussed on this issue's cover CD, please contact Roadshow New Media on 1-800-672-527. APC readers are eligible for a 20 per cent discount on all purchases made through the CD. Please contact Roadshow New Media regarding all technical support issues relating to installation and use of the CD.

the last four categories, only the initial screens can be scanned. The Inventions section, however, allows for a little further exploration. Click on the Inventions button and a new screen comes up, with five buttons representing areas where Leonardo's innovative spirit produced marvels: flight; music; water; civil engineering and warfare. Hit the Flight button, watch the Mona Lisa duck the flying aeroplane and you'll be through to a screen displaying four of his inventions that had the sky as their aim; pedal-powered wing; landing gear, parachute and helicopter. Only the pedal-powered wing is available in the demo version. The other categories proceed in much the same manner. In each category, one

invention is available for limited exploration.

Should your interest be piqued enough to buy the full CD-ROM, you'll find a world of interactive marvels awaiting you. In the Inventions section, each item has the appropriate pages from Leonardo's notebooks displayed. While the voice gives further details, a small animation runs to show how the theory was supposed to have worked. In many cases movie footage is played to illustrate a point. Another screen will then appear, giving you the choice of reading and hearing Leonardo's words on that subject, seeing how his ideas compare to what has developed in our times, and the opportunity to play a game or see an animation in 3D (3D glasses are included in the final package).▲



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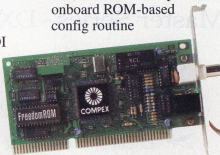
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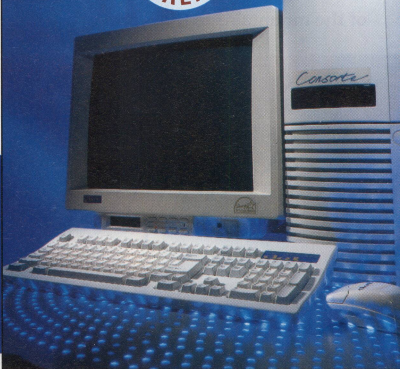
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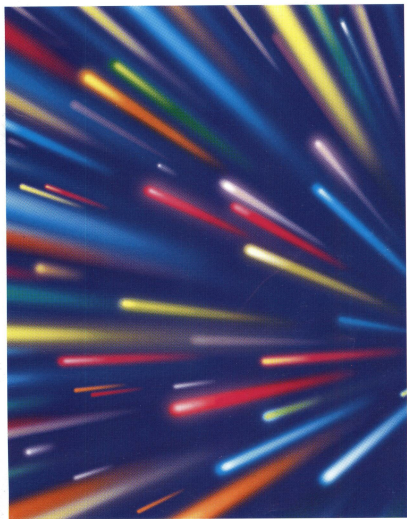
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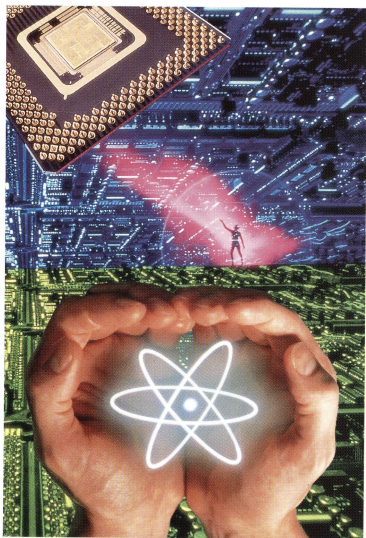


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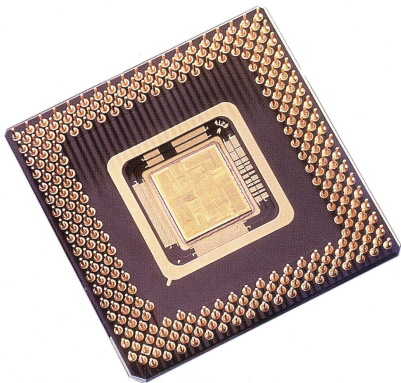
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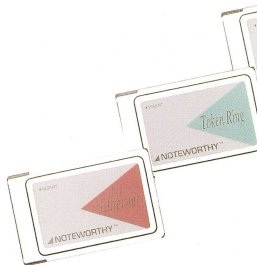
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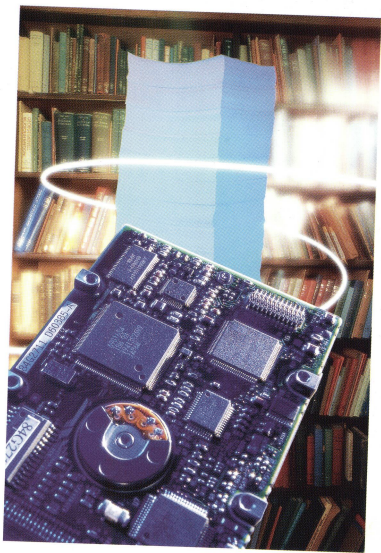
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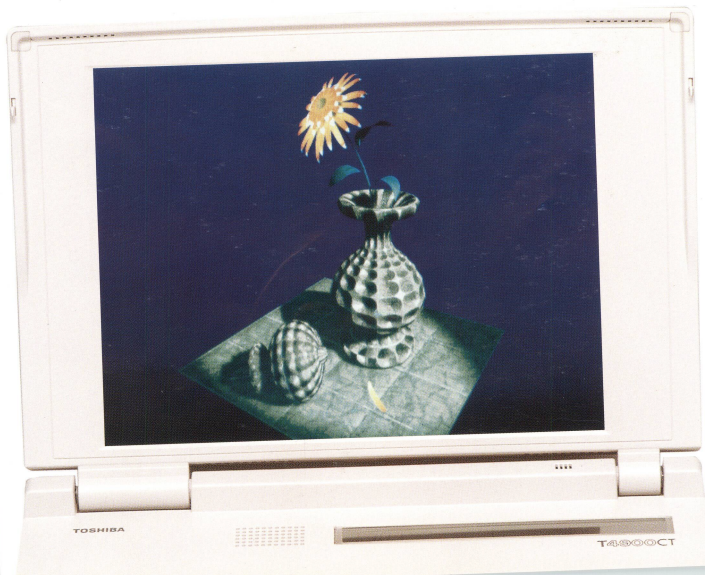


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Every year, in mid-October, the best and the brightest in the world of microprocessor design converge on the San Francisco Airport Marriott for the Microprocessor Forum. In an event orchestrated by Michael Slater, editor/publisher of the *Microprocessor Report*, they reveal to the world and each other just what they've cooked up in the way of new microprocessors. Here you will find the chip that will power your system next year or the year after.

This year, the microprocessors announced at the forum make up a most interesting group. Collectively, they represent the current state of the art in microprocessors. Individually, they carry the hopes, dreams, and fortunes of some of the biggest companies in the industry.

Knockin' on Intel's door

For the past few years, AMD has enjoyed a fair measure of success in the x86 market. In the face of never-ending litigation with Intel over the terms of a technology-sharing agreement gone sour, the company has carved out a significant portion of the x86 market.

Despite its success in the courtroom and in the marketplace, AMD has been beset by a serious problem: because its designs are derived from Intel's, it has lagged at least a generation behind Intel in getting processors to market. It always plays catch up, never reaping the substantial financial benefits that accrue when you are the sole source of the fastest x86 processors.

The K5 is AMD's declaration of independence. The only thing it shares with Intel's processors is the x86 architecture. Thus, to a programmer — or to any software a programmer produces — the K5 is indistinguishable from a Pentium or a 486.

Where K5 differs is in its microarchitecture. It processes x86 instructions in a dif-

ferent way from a 486 or Pentium. It is the latest in a series of fifth-generation x86 processors — NexGens Nx586 and Cyrix M1 are others — that operate differently from the Pentium, yet achieve the same results. In 'AMD vs Superman,' Tom Halfhill describes the technology of the K5 and discusses its implications in the marketplace.

New beginnings

An early commercial pioneer of RISC technology, Sun Microsystems rode the performance advantage of its SPARC architecture to the top of the workstation world, leaving its competitors scrambling to catch up. Well, the scramble is over, and Sun is now in a tight spot.

On the high end, SPARC has been unable to compete with newer RISC architectures: DEC's Alpha, Hewlett-Packard's PA-RISC, and Mips Computer System's Mips — just about every architecture regularly surpasses the performance of SPARC. On the low end where Sun has long enjoyed a price/performance advantage, PCs based on the Intel Pentium (and soon the K5, M1, and Nx586) often outperform SparcStations. What's a company to do?

Sun's solution is to regain the technology high ground that first propelled it to prominence. The visible manifestation of this solution is UltraSparc, a 64-bit SPARC implementation. In 'SPARC Strikes Back,' Peter Wayner examines how UltraSparc stacks up against the competition.

Moving forward

Another major announcement out of the Microprocessor Forum comes from Mips. Like Sun, Mips has not often been on the leading edge of performance, but this seems more by design than anything else. Recently, with its many partners, Mips has devoted much time and energy to derivatives such as the ultra-low-power R4200,

the floating-point-intensive R8000/8010, and the low-cost R4600 Orion. In doing so, however, Mips has seen its mainline R4000 and R4400 processors slip further behind the leading edge.

The T5 changes all that and gives Mips a needed boost in performance. Tom Halfhill reports on the ins and outs of the T5 in 'T5: Brute force' on page 92.

End of an era?

Back in 1991, when Apple, IBM, and Motorola announced their intention to create a new processor architecture, and IBM and Motorola agreed to jointly design the first four implementations of that architecture, most observers were sceptical that they could pull it off. The PowerPC 620, the high-performance member of the PowerPC family, is the visible capstone of the PowerPC alliance. With the 620, IBM and Motorola have moved the PowerPC to 64 bits. Tom Thompson describes its workings in 'PowerPC 620 soars' on page 86.

The 620 is the last processor that IBM and Motorola are committed to designing together. Whatever the future of the PowerPC architecture, the first four members of the line will always stand as landmarks of creative technical collaboration.

Offstage lights

Among the companies without major CPU announcements at the forum was DEC, which jumped the gun by announcing the 21164, the world's fastest MPU (micro processor unit) last month.

HP and Intel are busy jointly developing a 'post-RISC architecture' (reportedly based on Very Long Instruction Word technology) that will run PA-RISC and x86 software. When they are ready sometime in 1997 or 1998 to announce the fruits of their labours, they will probably do it at the Microprocessor Forum.

Bob Ryan

AMD versus Superman

Can AMD finally deliver on its promise to overtake Intel?

..... Page 68



SPARC strikes back

UltraSparc puts Sun back into the high performance universe.

..... Page 80



PowerPC 620 soars

The newest PowerPC chip takes a 64-bit bite.

..... Page 86



T5: Brute force

The newest supascal CPU shows how to gain speed.

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AMD versus Superman

The quad-issue K5 series is AMD's long-awaited answer to Intel's Pentiums. Its RISC-like core and innovative approach to x86 decoding may propel it past the Pentiums of today, but Intel isn't standing still.

By Tom Halfhill

Originally it stood for Kryptonite, the mythical substance that could destroy Superman. But to avoid legal hassles with D C Comics, AMD changed the code name of its fifth-generation x86 chip to Krypton-5, or K5. That compromise is symbolic of AMD's long quest to challenge Intel's supremacy in microprocessors — a quest that has been dogged with legal obstructions and technical hurdles at every turn.

Since 1990, lawyers for AMD and Intel have been fighting tedious court battles over contractual language and microcode. By 1994, it seemed that AMD was gaining the upper hand. But lawsuits were only part of AMD's troubles. For years, AMD has lagged at least a full generation behind Intel in x86 evolution, relying heavily on licensed technology and minor variations of Intel chips to carve out a pittance of market share. Intel's 1993 introduction of the Pentium — the first superscalar x86 processor — threatened to widen the gap and knock AMD out of the contest altogether.

But at AMD's labs in Austin, Texas, engineers had begun work on a new x86-compatible microprocessor family. Their goal was to create a series of chips that would leapfrog Intel's Pentiums and put to an end to AMD's perennial follow-the-leader status. To reach that goal, they had to start working on the K5 before they knew any significant details about the Pentium. This ensured that the K5 would not be a derivative design, but it also put enormous pressure on the engineers to devise a superior microarchitecture without sacrificing software compatibility.

There was honour at stake, too, after Intel CEO Andy Grove denounced AMD as "the Milli Vanilli of semiconductors," a reference to the pop singers who were stripped of a Grammy award for lip-synching their songs. Grove dismissed AMD as a clone company: "Their last original idea was to copy Intel."

AMD CEO Jerry Sanders, visiting Austin for a quarterly strategy meeting in late 1993, declared that an independently designed fifth-generation x86 chip was AMD's top priority. Work had already started in July 1992, but incredibly, the team consisted of only two engineers: Mike Johnson, director of advanced processor engineering, who also fathered AMD's 29000 embedded RISC chip, and Dave Christie, who began modeling various design alternatives on a software simulator written by Johnson. Later, they were joined by Dave Witt, who became the design manager. But several months passed before the number of K5 engineers in the lab exceeded the number of lawyers in the courtroom.

After two years of effort, the result is a truly creative design that makes AMD's promise to catch Intel at least credible, though by no means assured. AMD says the K5 is its first x86-compatible CPU family that discards all vestiges of Intel's intellectual property



(including microcode) while delivering better-than-Intel performance. According to AMD's simulations, the first K5-series chip will run real-world applications (for example Microsoft Word, Excel, and CorelDraw) about 30 per cent faster than a Pentium at the same clock speed. AMD says it could do even better with artificial benchmarks such as SPEC and Dhrystone — and without optimised compilation.

Johnson credits the K5's performance to larger primary caches and a more aggressive superscalar design. Instead of the Pentium's twin integer pipelines, with their many restrictions on parallel

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x86 WARS UPDATE

It appears 1995 will be the year when fifth-generation x86 microprocessors come into their own. Although volumes of 486-class chips are expected to remain strong, the proliferation of 586-class CPUs will give system makers and users many options, forcing system prices well below \$3000 by the end of 1995.

Intel will continue introducing new variations of the Pentium. This December, Intel is promising to release the P24T, the long-awaited Pentium OverDrive chip for systems with special upgrade sockets. To address the heat problems known to afflict this CPU in some systems, the P24T will run at 3.3V and include a tiny fan and a piggybacked voltage transformer for compatibility with 5V motherboards. Another Pentium variant, code-named P55C, is expected to shrink the die to a 0.4-micron process and perhaps add more cache. Intel will also introduce a 75MHz version of the P54C-series Pentium.

Sometime in 1995, Intel plans to announce the P6, the first sixth-generation x86 processor. Virtually nothing has been publicly disclosed about this CPU, but it's expected to be a multiprocessor module that modestly improves on the Pentiums superscalar core. There's also a rumour that the P6 uses some patented technology

that will make it legally difficult for vendors of other x86 processors to use the same supporting chip sets. Appreciable volumes of the P6 probably won't reach the market until 1996.

NexGen recently saw Alaris ship the first systems using its Nx586 processor. It will be interesting to see how well this newest entry fares in the chip wars. Although the Nx586 will be its first product, NexGen has been working on the design since 1986. NexGen has some strong financial backers, and the Nx586 is being manufactured by IBM Microelectronics.

Cyrix says it will deliver samples of its M1 processor this year and begin volume production in 1995. Like AMD and NexGen, Cyrix has designed a superscalar microarchitecture that is more flexible than the Pentiums and has enough potential to compete with all the new Pentium variations now appearing. Also, like its fellow x86 competitors, Cyrix has perennially lagged at least a year behind Intel, and its efforts to close that gap will depend on whether the P6 is a radical leap beyond the Pentium.

IBM Microelectronics is manufacturing the M1 and has also acquired the right to sell the chip under its own name. Such an endorsement from IBM could go a long way toward establishing the credibility of Cyrix in the high-end x86 market.

execution, the K5 has a five-unit, four-issue superscalar architecture that unites a RISC-like core with a unique x86 instruction decoder.

The decoder, by far the most complex and fascinating part of the chip, strives to minimise the liabilities of the x86 instruction set by splitting the long CISC instructions into smaller RISC-like components called R-ops. These R-ops, in turn, are dispatched four at a time to a core that borrows heavily from RISC. Dynamic register renaming, branch prediction, speculative execution, and out-of-order execution — it's all there. The K5 implements a hybrid CISC/RISC technology that is also evident in the Nx586 chip from NexGen and will almost certainly be a larger feature of Intel's next-generation x86, code-named P6.

The K5's design had better be forward-thinking, because the competition isn't standing still. The P6 is expected to debut next year, when AMD will just be ramping

up production of the K5. At the same time, NexGen will be shipping the Nx586 and Cyrix will introduce yet another fifth-generation x86, the M1 (see the text box 'x86 Wars Update').

AMD claims the K5's microarchitecture has enough performance headroom to compete with all these processors, and that faster versions will soon follow. There's already talk about a K6 that could debut late next year or early in 1996. The K6 might depart even further from its Intel ancestry by abandoning pin-compatibility with Intel's x86 chips. (In contrast, the K5 is pin-compatible with the P54C-series Pentiums.) As with most wars of independence, AMD's struggle with Intel will not be won easily or cheaply.

CISC/RISC fusion

Intel's public commitment to CISC notwithstanding, it is generally recognised

that future gains in x86 performance will be achieved by working around the inherited limitations of the x86 instruction set. CISC was a good idea when Intel conceived the original 8086 in the 1970s and was trying to cram a rich instruction set onto a 29,000-transistor chip. But a processor like the K5, which incorporates 4.1 million transistors, has different priorities. It is bound by how fast it can fetch, decode, and execute instructions, not by the computational wealth of its instruction set.

The pure RISC approach would be to dump the x86 instructions altogether and replace them with modern, streamlined instructions. However, the x86's greatest liability is also its greatest asset: an instruction set that runs more software than any other architecture in the world.

The approach now being explored by all x86 engineers — including those at Intel, AMD, Cyrix, and NexGen — is to integrate CISC and RISC technologies without abandoning backward compatibility. Special attention is being focused on the x86 instructions themselves, which are troublesome because of their complexity and variable lengths. After evaluating several different solutions, AMD finally settled on a sophisticated decoder that turns complex x86 instructions into relatively simple and fast-executing R-ops.

R-ops bear a strong resemblance to the microcode instructions that are inherent in all x86 processors. Every x86 chip executes its most complex instructions as a sequence of microinstructions fetched from an internal microcode ROM, though the most recent x86 chips minimise the use of microcode by hard-wiring the simpler instructions. But the K5's R-ops are subtly different: The vast majority of them are generated on the fly by the decoder, not from microcode.

But microcode still handles the most complex and infrequently encountered x86 instructions, such as string operations and transcendentals. Even in those cases, however, the result is a stream of R-ops identical to those generated by the decoder. The R-ops have so much in common with RISC instructions that AMD used an assembler for its 29000 RISC processor during early phases of the K5's development.

The transition from x86 instructions to R-ops begins even before the K5 fetches from its primary I-cache (instruction cache). During I-cache loading, instructions are predecoded — every byte is tagged with additional bits of information. These tags mark the instruction boundaries, identify the various fields within each instruction, and (in the case of branch instructions) predict where the branch will be taken.

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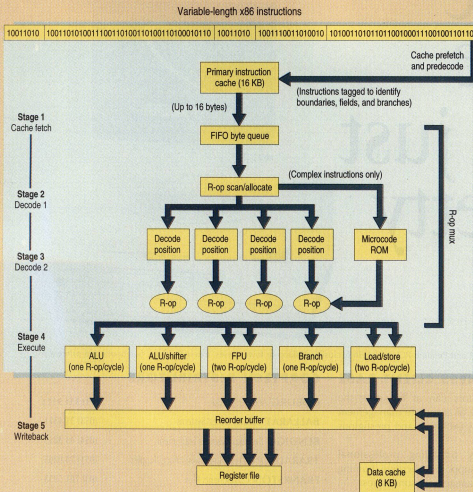
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K5 Pipeline: Melding CISC and RISC



As the K5 prefetches variable-length x86 instructions into its primary cache, it tags them with predecode information that will assist full decoding later. Every cycle, the chip features up to 16 bytes' worth of tagged instructions from the instruction cache into a byte queue. The byte queue stores the x86 bytes and predecode information from a stream of speculative cache lines and merges them with the currently accessed cache line. From there, a two-stage decoder converts the x86 instructions into relatively simple, fast-executing R-ops and then dispatches them to five independent functional units. These units can execute as many as five instructions in original program order to forward intermediate results and recover from mispredicted branches and exception.

The purpose of this predecoding is to reduce the amount of work required later when the instructions enter the execution pipeline for final decoding. Just marking the instruction boundaries saves time, because x86 instructions can vary in length from 8 to 120 bits, so the processor has to figure out where one instruction ends before fetching the next. (RISC chips avoid this problem by using instructions that are always 32 bits long.) By marking the instruction boundaries during predecode, the K5 resolves these serial dependencies before the instructions even reach the cache.

Identifying the fields in each instruction helps, too. Later, when the processor fully decodes the instructions, it can quickly

distinguish between op codes and their various operands.

All this predecoding happens in the same cycle as the cache prefetch, before the instructions enter the execution pipeline, so it doesn't add a stage to the pipeline or delay execution. It is also supervised by a coherency mechanism that watches for self-modifying code, another bane of x86 design.

One drawback of predecoding is that it makes the long x86 instructions even longer. To compensate, the K5's primary I-cache is twice as large as the Pentium's: 16K versus 8K. (Actually, the K5's I-cache has about 24K of array space, but AMD quotes it as having 16K because it's equivalent to a conventional 16K cache

filled with untagged instructions). Both the I-cache and the separate 8K data cache are linearly addressed and four-way set-associative, which is more efficient than the Pentium's two-way set-associative caches.

Instruction fission

Final decoding is a two-cycle process that begins by fetching the tagged instructions from the I-cache into the decoder. Decoder is something of an understatement. This is really the heart of the chip, where x86 instructions are converted into the five functional units (two integer, one FPU, one branch, and one load/store). AMD refers to the decoder as the R-op mux (R-op multiplexer).

If you picture the CISC instructions as heavy atoms, the R-op mux is like a nuclear reactor that splits them into elemental RISC particles. Among other things, this fission allows the K5 more flexibility in arranging out-of-order execution. A single x86 instruction might break down into multiple R-ops that are dispatched to different functional units, executed separately, and then completed out of order. (Eventually, of course, to preserve software compatibility, the results are restored to their original program order.)

To start the fission process, up to 16 bytes are fetched from the I-cache in a single cycle. The bytes enter a special FIFO (first-in/first-out) queue called the byte queue. This queue is scanned for enough bytes of predecoded instructions to generate four R-ops. It is possible for a single byte in the queue to contain enough information to generate four R-ops, but more likely several bytes will be consumed. As bytes exit the queue, more are fetched from the I-cache. These bytes don't have to originate from the same cache block; indeed, they often represent different speculative threads of execution that are scattered throughout the cache.

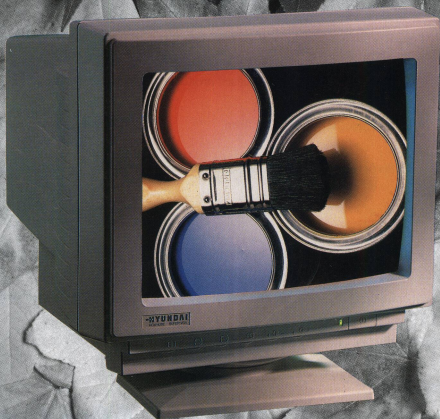
Next come the two decode stages. From the byte queue, the four R-ops' worth of instruction information are transferred to four identical decode positions and then are converted into R-ops. The four R-ops don't necessarily bear a direct x86 instructions. They may represent a single instruction, multiple instructions, or fragments of



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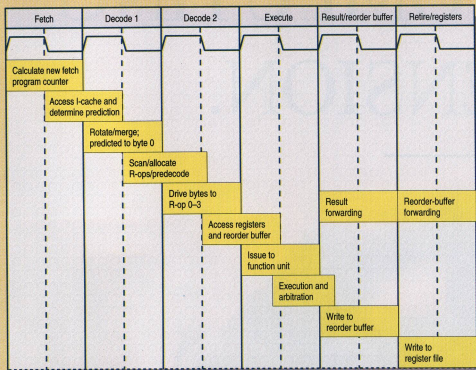
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Stage timing in the K5 pipeline



The stages of the K5 pipeline provide more evidence of its RISC-like nature. Unlike traditional 486/Pentium pipelines, which have a separate address-generate stage, the K5 uses an execution unit — the load/store unit — to handle external memory accesses. Also, the K5 adds a retire stage in which the results are finally allowed to update the architectural state of the processor. As with the 486 and Pentium, instructions are said to complete after the fifth stage, with the retirement stage needed to reorder instructions that execute out of order.

an x86 instruction. It all depends on the original instruction's complexity.

The simplest x86 instructions (for example, a register-to-register add) map directly to single R-ops. For example, a stack-relative memory-to-register add is broken up into a pair of R-ops: one to load the register and another to add the registers. A stack-relative register-to-memory add would yield three R-ops: one to load the register, one to add the registers, and one to store the result. Instructions that divide into three or fewer R-ops are called *fast instructions*.

If a complex x86 instruction (for example, a string operation) requires more than three R-ops, it traps into the microcode ROM. This can produce hundreds of R-ops. However, the microcode sequencer generates these R-ops in clusters of four per cycle, so they're issued to the functional units in parallel, just like the fast-instruction R-ops. The sequencing continues until the complex instruction is finished. Then the byte queue resumes processing fast instructions. In practice, this microcode detour rarely hap-

pens, because today's smart programmers and compilers avoid the worst x86 instructions.

At this point, the fission is complete: The CISC instructions have been converted into quartets of fully decoded R-ops that, on average, are 59 bits long. Even though that is longer than true RISC instructions, they carry decode information and operand fields that get separated later. What's important is that R-ops are much more manageable than x86 instructions, and the vast majority will execute in a single cycle.

Under optimal circumstances, the K5 can convert four x86 instructions into four corresponding R-ops in a single cycle, making it four-issue superscalar on both the x86 and RISC sides. In practice, it will attain optimal issue rates far more often on the RISC side than on the CISC side.

Point of order

During the next stage, the R-ops are dispatched in parallel to a set of reservation stations, which act as queues for the func-

tional units. Because the load/store unit is deemed the most vital, it has six stations. Other units have as few as two. Each integer unit (an ALU and an ALU/shifter) has two stations, making a total of four stations that can handle integer-type R-ops.

The functional units execute the R-ops at a peak rate of five per cycle, although the K5 can retire only four per cycle. The units are completely independent, so they are free to complete their instructions out of order if there are no dependencies (that is as long as the completion of one instruction does not depend on the result of a previous instruction).

Without some kind of reorder mechanism, of course, the K5 would play havoc with existing software. To ensure that results are retired in program order each R-op gets an entry in a 16-slot reorder buffer, which keeps track of the original instruction sequence. When the reorder buffer gives the green light, the R-ops are retired in program order by writing their results to the architectural registers and the 8K dual-ported data cache. The K5 completion mechanism is analogous to the one used in the PowerPC 604.

In addition, the reorder buffer makes sure instructions are completed in their entirety before yielding to an exception. Otherwise, an instruction might be left partially completed if it was split into multiple R-ops that were executing out of order when the exception occurred. (In cases where the x86 lets some complex instructions be interrupted by an exception, the K5 allows this, too.)

In addition, the reorder buffer is responsible for register renaming, another RISC retrofit for the x86. A well-known limitation of the x86 architecture is its eight GPRs (general-purpose registers), a rather sparse register file by today's standards. The K5 has 16 logical GPRs, any of which can be renamed to represent the eight physical registers that x86 software expects to see.

Branch prediction is handled a little differently than in other advanced microprocessors. Instead of maintaining a separate branch target buffer to hold the addresses of predicted branches, the K5 appends the predicted address to the branch instruction during predecode. This 10-bit tag, called a *successor index*, points to a target within the I-cache.

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Even though not even AMD would claim the K5 is a fault-tolerant processor, it's comforting to know there's a mechanism of last resort that is robust enough to handle a logic glitch and confused code.

At first, all predecoded branch instructions are predicted *not taken*. Later, if speculative execution reveals that the prediction was wrong, the prediction is reversed by writing a new successor index that points to the correct cache block. That prediction remains in effect until it's wrong again. In other words, the prediction is reversed every time it's wrong.

This is one reason why the cache blocks are only 16 bytes in size. The K5 can predict only one taken branch per block, so a smaller block reduces the chance that an instruction will branch to another branch in the same block. A 32-byte cache block would reduce performance, according to AMD's simulations.

Although the branch prediction is 'dynamic' in the sense that it adapts to wrong predictions at run time, it does so merely by reversing its predictions in a binary flip-flop. In contrast, some of the latest RISC processors use algorithms that dynamically predict the outcome of branches by keeping track of how often a particular branch is actually taken. But RISC chips don't have to bother with complicated x86 decoding. By adopting a somewhat simpler form of branch prediction, the K5 keeps an already complicated decoder from becoming even more labyrinthine.

There is another advantage to the K5's approach: In effect, it predicts branches over a larger sample of the program than other methods. Branch target buffers have a limited number of entries, usually a few dozen. However, the K5 can theoretically predict a branch in every cache block. Since the block size is 16 bytes and the 1-cache is 16K, that's potentially 1024 branches. This larger sample—coupled with the K5's flexible cache fetching—partly offsets its less sophisticated predictions. Of course, when the cache is flushed, all the prediction states are lost, too, because they're tagged to the instructions instead of being held in a branch target buffer.

To make this whole mechanism complete, the K5's

byte queue can trigger a special signal called *BQ confused*. It waves this flag when the predecoded instructions don't appear to make sense because of a mispredicted branch or some other anomaly. The signal wipes out the incoherent cache blocks and reloads them with freshly predecoded instructions. Johnson says this rarely happens, but it is so reliable that it once masked a bug in the K5's critical logic path during the chip's early development. Even though not even AMD would claim the K5 is a fault-tolerant processor, it's comforting to know there's a mechanism of last resort that is robust enough to handle a logic glitch and confused code.

RISC to the core

We've paid relatively little attention to the K5's core because once the x86 instructions are fully decoded into R-ops and dispatched to the functional units, the K5 core is basically a conventional RISC chip. The K5 core was closely patterned after an upcoming superscalar version of the 29000. Indeed, both the K5 and the new 29000 implement the theories expounded

in Johnson's book, *Superscalar Microprocessor Design* (Prentice Hall, 1990). Johnson and Christie modelled early designs of the K5 with a simulator called T-Sim that Johnson wrote for his book. It's interesting to note the resulting architectural differences between the K5 and the Pentium.

The biggest difference is that the K5 has five parallel-functional units instead of two parallel-integer pipelines. Like the Pentium, it can execute two integer operations simultaneously; but unlike the Pentium, it can also execute a floating-point instruction, a load/store, or a branch at the same time. The larger register file and a load/store unit that can perform two operations per cycle keep memory fetches to a minimum.

Another key difference is that the K5 allows out-of-order execution, while the Pentium does not. Overall, the K5 takes a broader approach to superscalar issue than Intel's fifth-generation chip.

One place where AMD cut corners was the FPU. Although the K5's FPU is adequate by x86 standards, it's not as fast as the Pentium's, which has more dedicated logic to make it more competitive with RISC chips. But even Intel says floating point is not particularly important for real-world PC software, so AMD's trade-off is reasonable.

AMD says the K5 was designed to deliver more performance headroom than the Pentium. According to AMD's simulations, adding cache to the K5 yields relatively more performance than adding cache to the Pentium, because the K5 isn't as close to its limit of core saturation. Adding cache is much easier than designing a faster core, so AMD hopes the K5 will remain competitive even when Intel debuts the P6 next year. Of course, this assumes the P6 won't introduce a significantly better architecture. If it does, AMD might not be any closer to catching Intel than it is now.

Nevertheless, the K5 proves that AMD can design a competitive x86-compatible CPU that isn't merely an Intel clone. From its unique R-op mux to its quad-issue superscalar pipeline, the K5 boasts a clearly innovative microarchitecture that inherits only what it must to remain compatible. Indeed, it's possible that Intel's P6 will more closely resemble the K5 than the K5 resembles the Pentium. If nothing else, the K5 will stand as AMD's declaration of independence.

AMD'S K5: WHAT'S NEW

- Fifth-generation x86-compatible microprocessor family
- Four-way issue superscalar architecture
- Five-stage pipeline
- Five parallel-functional units: ALU, ALU/shifter, FPU, branch, and load/store
- 16K instruction cache, 8K dual-ported data cache, linear addressing, four-way set-associative
- Out-of-order execution, branch prediction, and speculative execution
- AMD's first completely non-Intel microcode
- Claimed performance: 30 per cent faster than the Pentium at the same clock speed. SPEC ratings not yet available
- Initial clock speed: 100 to 120MHz — up to 150MHz in 1996
- Internal/external clock ratios: 1x, 1.5x, 2x, and 3x
- 4.1 million transistors
- 3.3V, three-layer metal, full static CMOS
- Initial version on 0.5 micron process, moving to 0.35 micron in 1996
- Pin-compatible with Intel P54C Pentium
- Samples this year, volume production in 1995
- Price: not announced but expected to be the same as P54C Pentium

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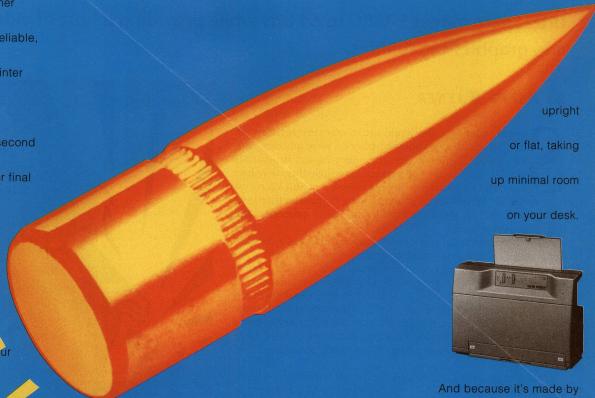
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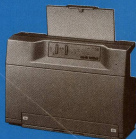
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SPARC strikes back

UltraSparc moves SPARC to 64 bits while providing a host of video and graphics capabilities.

BY PETER WAYNER

Several years ago, the world order was very regimented: computers were computers, phones were phones, and TVs were TVs. Today, the coherency of that structure is rapidly blurring as microprocessors wiggle their way into more and more places. The next version of Sun Microsystems venerable SPARC line is aimed at being both faster than ever and more suited for the diverse rolls that a microprocessor will play in the video world.

Sun made substantial and incredibly varied changes to SPARC. The most exciting one is including on-chip a collection of image-processing functions that can operate on up to eight pixels at once. Other changes are where the designers have tweaked the structure of context switching to allow SPARC to better run multithreaded operating systems and have improved the instruction set to allow optimisation by compilers. Some changes are necessary to bring SPARC into the 64-bit world that Alpha and Mips, at least, have inhabited for years. Other changes are more specialised and detailed.

The changes to SPARC come in two forms: At the abstract level, Sun has issued the SPARC-V9 revisions to the SPARC architecture that spell out in detail what constitutes a SPARC-compatible chip. This permits companies such as Fujitsu to produce their own versions of the latest definition of SPARC. SPARC V-9 is the first major set of revisions to emerge since the commercial SPARC architecture was announced in the 1980s as the SPARC-V7. SPARC-V8 contained relatively minor revisions to the original architecture.

On the more concrete level, Sun has announced UltraSparc, the first implementation of the SPARC-V9 architecture. This chip will be produced in a partnership with Texas Instruments.

Although the final numbers are not available at this writing, Sun hopes to produce a product that runs between 250 to 300 SPECint92 using a chip that runs about 200MHz. Sun expects the processing ability to scale linearly with the clock speed. This chip should be available in samples by early 1995 and in quantity by the end of 1995.

Pieces of eight

The built-in instructions for handling video tasks are perhaps the most novel addition to the architecture. Digital manipulation of graphics and video data in computing environments is growing exponentially, and many companies are developing specialised chips to handle these tasks. UltraSparc represents one of the first general-purpose processors to integrate these functions. It has specialised hardware to process image data packed in the typical RGB and alpha format. Each of these components can be represented with either 8, 16, or 32 bits. The instruction set includes new instructions that will load and manipulate data in 64-bit block can be either added to or multiplied by the pixels in another 64-bit block in a single operation.



The image manipulation is performed in the FPU, which normally operates on 64-bit floating-point quantities. In the case of pixel addition, the chip simply forgets to carry a bit every 8, 16, or 32 bits. The process is more complicated for pixel multiplication and relies heavily on shifters that are used extensively in floating-point arithmetic.

The pixel operations can also be split to increase processing parallelism. For example, one of the new instructions can multiply four 16-bit numbers by four 8-bit numbers without choking the pipeline. If you want to do 16 by 16-bit multiples, then you use two of these instructions and combine the results with an addition.

The ability to perform up to eight operations at once in parallel is useful when compressing and decompressing video images.

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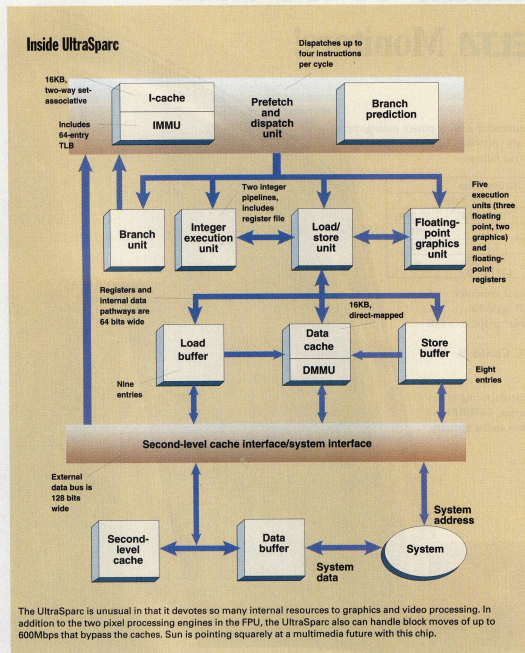


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The most time-consuming part of the MPEG algorithm is trying to analyse the motion of the image by comparing each part of the current frame against the previous frame.

The UltraSparc comes with a special instruction that will do the eight subtractions, eight absolute values, and eight additions this comparison takes — as well as the final work of aligning the information — all in a single graphics-unit operation.

A special memory system automatically loads pixels in 8-byte blocks without a separate instruction. When these specialised instructions are pipelined, the chip will sustain one operation per cycle.

The benefit of these special instructions

is enormous. Sun hopes that the UltraSparc will be able to deliver performance that is up to 80 times faster than other RISC processors on pixel manipulation operations. Sun estimates that the chip will be able to decompress two MPEG-2 video streams and perform video processing in real time. On the other end, the chip should be able to provide real-time MPEG-2 compression.

It is not clear whether these instructions will provide similar gains to other applications. Several more specialised scientific applications may be able to use the parallelism to speed up the work substantially. The ones that will benefit will be those that can operate with low-precision, fixed-point values.

Memory improvements

The greatest headache for any modern processor designer is getting data on and off the chip. The UltraSparc has several features that should significantly improve the memory performance of the chip. Some of these changes will boost multimedia performance, and others are aimed at helping average system tasks.

The biggest change, at least in the volume of bits moved, is a new block move instruction that circumvents the normal cache structure. Using this instruction, you can move up to 600Mbps across the processor/memory bus. This lets the main processor act as the video processor by blitting data on and off the screen. This block move also comes in handy in other applications that shuffle memory. Sun's system architects say that they've watched the TCP/IP networking software move packets of data up to eight times before it reaches its final destination. Given that most UltraSparc machines will be networked, the block move instruction can help hold down networking overhead.

The other parts of the memory interface are fairly standard. The UltraSparc has split primary caches. The data cache is 16K and direct-mapped, while the instruction cache also holds 16K, though it is two-way set-associative. Both caches have their own TLB (translation look-aside buffer). The UltraSparc also comes with an on-chip cache manager for an off-chip second-level cache. You only need to add SRAM (static RAM) to have a fully functioning second-level cache.

Instruction fetching is tightly integrated with the first-level instruction cache. The instructions stored in the cache are predecoded to speed their processing when they enter the execution pipeline. Every two instructions in the cache are associated with two bits that are used to predict branches taken by the instructions. The two bits keep track of four different states that encode the last two paths taken by these instructions.

The prefetching mechanism uses the

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ULTRASPARC HIGHLIGHTS

- Multimedia instructions can process up to eight pixels at once for MPEG decompression.
- Upgrades SPARC to 64-bit architecture.
- Single-cycle branch prediction integrated into first-level cache.
- Fabricated on Texas Instruments 0.5-micron CMOS, 3.3V four-layer metalisation process.
- Sun claims 250 to 300 SPECint92 at 200MHz.
- Samples in the first quarter of 1995; ships in 1995.
- Integrated second-level cache support.
- Speculative loads allow a load that might fail because of a nil pointer to be done without testing.
- Up to 600Mbps block data transfer without affecting caches.
- Nested traps.
- Logic units: two integer, two floating-point/graphics addition, two floating-point/graphics multiplication, one floating-point division/square root, one branch, and one load/store.
- 16K instruction cache; 16K data cache.

bits to dynamically predict branches. Sun's preliminary studies show that the UltraSparc is able to predict the right path in 88 per cent of the branches taken in the SPECint92 test suite and 94 per cent of the time in the SPECfp92 set.

Into the pipeline

The execution pipeline is the backbone of a modern chip, and its structure defines the performance limits. The UltraSparc comes with a nine-stage pipeline that can issue up to four instructions per cycle. The first two stages are standard: the instructions are fetched and then decoded.

The third stage groups together any possible instructions that are available for issue to the execution units. The chip will not issue the instructions out of order, and Sun is confident that its compilers will be able to do a good job scheduling the instructions to maximise throughput. There are particular rules about which instructions may be bundled together. There is a limit of two integer operations, two floating-point or graphics operations, one load/store memory access, and one branch that can be issued each tick of the clock. Even though this adds up to six possible instructions, only four can go at once.

In addition, this stage is responsible for getting the information from the registers. If the information is not ready, it will stall any instruction that depends on it until it is ready. Sun says that it is closing in on the magical one-instruction-per-cycle average.

After issue, the pipeline splits into two parts. One fork handles the integer and memory instructions and the other handles the floating-point and graphics instructions. The floating point instructions travel down a three-stage pipeline that is tuned to handle everything except floating-point

division and square roots. A separate functional unit attacks these without stalling the pipeline. The chip issues instructions in order, but they don't need to finish in the same order.

Basic integer instructions execute in one cycle. Others such as integer multiplication and division have variable latencies. For example, the UltraSparc executes two bits of the multiple and one bit of the divisor per cycle (the chip is thus very human in its performance: bigger numbers take longer). Once an integer instruction executes, a bypass mechanism makes its results available immediately, rather than after the writeback stage.

The rest of the integer/memory pipeline is devoted to handling the loads and stores. These can occasionally take a long time if the data is not available in the on-chip cache. Sun worked to keep these stages in the integer pipeline the same size as the floating-point pipeline so that the results from the two can be rejoined in the final stage when the information is written back to memory or registers. These loads and stores do not have to finish in their programmed order, which significantly adds to pipeline throughput.

Context switching

The pipeline structure governs how well a chip will do on a straight-line segment of code, but it says little about how a chip will perform on a desktop when it is often forced to handle a number of different programs. The ability to switch quickly between different blocks of code (that is, context-switching) is becoming more important than ever because both modern multithreaded operating systems and OOP (object-oriented programming) are slicing the programs into smaller bits or contexts.

The SPARC architecture is the only RISC

processor on the market that uses register windows. Instead of 32 basic registers, the chip offers eight overlapping windows of 24 registers each. The theory behind these windows is that when a new procedure or thread begins, the windows would obviate the need to write the old information out to memory; the new context would simply be a new 'window of registers'. In practice, many compiler writers found that they would quickly exhaust the supply of windows so they needed to pause and write the information to memory anyway.

Register windows have caused Sun some grief. Other RISC designers were able to produce nice small sets of 32 registers with a much simpler design that would run faster. Also, other compiler designers found they didn't need many of the advantages of the overlapping nature of the registers because they could simply compile short procedures in-line. Sun couldn't abandon windows without losing backward-compatibility with the old SPARC software. For this reason, with UltraSparc, it concentrated on adding several different improvements of handling context switches.

One of the neater solutions is providing another fresh window of registers everytime a trap, an interrupt, or an MMU (memory management unit) trap is sprung. Anyone writing a software routine implemented as a trap must ordinarily save all the information in the registers so that the routine does not destroy the results of the process that was interrupted. The UltraSparc provides eight fresh registers that can be used without worry in these cases. This should significantly improve the speed at which the UltraSparc handles code of multithreaded operating systems that use many traps and interrupts.

Onward, upward

In its early years, Sun recognised that the main demands on a desktop Unix box were to do simple integer pointer arithmetic and move the data around. So it produced a RISC instruction set that did just this and nothing more. Now that the system demands on a desktop machine are no longer as significant, Sun is changing the instruction mix to supply what they hope desktop users will want: hot graphics and video processing.

The graphics instructions and the fast block data transfers should let Sun build low-cost desktop systems that offer stunning video processing. The graphics-processing instructions will be able to speed up video processing and graphics generation. This should become a tantalising addition to the desktop and may even let Sun make substantial inroads in the potential market for set-top computers.

PowerPC 620 soars

Its faster logic, shorter pipelines, and high-speed interface endow it with processing power that raises it to workstation and server calibre.

By Tom Thompson and Bob Ryan

In 1991, Apple, IBM, and Motorola formed an alliance whose goal was to create a new hardware and software standard for personal computing. The hardware portion of the standard is centred around the PowerPC architecture, a 64-bit machine environment that uses a single-chip RISC processor. This architecture serves as a template for a growing family of PowerPC processors, each with a design carefully tailored to address the computing needs of a different market.

The IBM/Motorola Somerset facility, located in Austin, Texas, is the worksite of the engineers responsible for creating the various processor designs. Since 1991, Somerset design teams working in parallel have introduced new versions of the PowerPC processor with relentless regularity. The PowerPC 601, a low-cost 32-bit implementation of the PowerPC architecture, was introduced in early 1993. Late that year saw first silicon on the PowerPC 603, a low-power 32-bit processor suitable for notebook computers. Early this year, the PowerPC 604, a high-performance 32-bit processor designed for high-end desktop systems, made its debut.

At the Microprocessor Forum in October, IBM and Motorola jointly announced first silicon on the PowerPC 620, the first 64-bit implementation of the PowerPC architecture in a processor. While the previous members of the PowerPC family were targeted for desktop PCs, the 620 is instead crafted for workstations and high-speed servers.

Based on simulations at 133MHz with 4M of secondary level-2 cache clocked at 66.5MHz, the PowerPC 620 posts performance marks of 225 SPECint92 and 300SPECfp92. Key design features, such as 64-bit internal data paths, 64K of on-chip cache, six independent execution units, and a high-speed bus interface, provide the high level of performance required by simulations and transaction processing. The 620 is code-compatible with earlier PowerPC processors and can execute existing 32-bit PowerPC programs, as well as new 64-bit programs written specifically to exploit features on the 620.

Sampling of the PowerPC 620 begins in the second quarter of 1995, and the chip should be available in limited quantities by the second half of 1995. Pricing was not set at press time, but it was expected to follow the competitive pricing set by other members of the PowerPC family.

Processor basics

The PowerPC 620 uses the 0.5-micron CMOS four-metal layer-fabrication technology, which is similar to that used in the PowerPC 604. However, the 620 fabrication process also uses an improved transistor design that switches faster, thereby improving overall performance. The PowerPC 620 operates at 3.3V, the same as the PowerPC 603 and 604.

As with these other two processors, an on-chip PLL (phase-locked loop) on the PowerPC 620 acquires the processor clock,

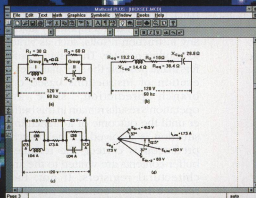


and the processor's bus interface can operate at one-half, one-third, or one-fourth the speed of the processor clock to support slower memory or devices. At 133MHz, the PowerPC 620 dissipates 30W in a worst-case scenario. The PowerPC 620 also sports the same power management features as the 603 and 604, which can be used to reduce power consumption and build an energy-efficient computer.

However, the PowerPC 620's resemblance to other members of the PowerPC family ends here. The chips design uses seven million transistors — nearly double the number in the 604 design. To house that many circuits requires a large (for a PowerPC) 311mm² die.

The extra transistors implement several key features. First,

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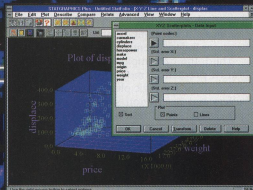


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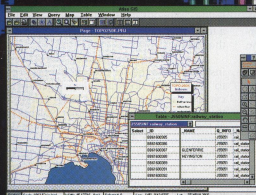
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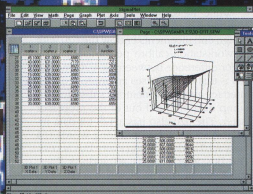
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because the 620 is a 64-bit processor, additional hardware is required to support 64-bit data types and 64-bit addressing. This means that many of the processor's internal data buses and buffers, as well as the GPRs (general-purpose registers) and FPRs (floating-point registers), must be 64 bits wide.

The second original feature of the 620 is the presence of two massive, 32K on-chip caches. The 620, like the 603 and 604, implements a Harvard architecture with separate code and data paths. One cache handles the code path, and the other handles the data. Each cache has its own MMU (memory management unit) and functions independently of the other.

Third, the 620 employs an aggressive branch-prediction mechanism that requires prediction logic plus 64-bit rename buffers and reservation stations to store speculated branch results. This, in turn, uses more transistors.

Finally, the processor's bus interface has been beefed up: the data bus is 128 bits wide, and direct support for a level-2 cache is built in. All these new features work in concert to boost the 620's performance.

620 interiors

At first glance, the heart of the PowerPC 620 looks identical to that of the 604. Both have the same six independent execution units: a load/store unit, a branch unit, an FPU, and three integer units. This enables up to four instructions to be fetched and dispatched at each tick of the processor clock. Because this and other 620 features resemble those of the 604, some comparisons to the 604 are necessary.

While the 620 uses a superscalar RISC core similar to that of the 604, specific design enhancements endow the 620 with its workstation-calibre performance. The major difference between the 620 and the 604 is that the 620 uses an improved bus-interface unit and memory subsystem to pump data into and out of the processor faster. The 620 also has a 128-bit data interface, so it fetches two long words (64 bits each) of data during every bus access. The bus interface has 40 address lines, which enables the processor to access 1TB of physical memory.

Note that although the 620 uses only 40 bits of address, internally it uses 64-bit effective addressing and thus supports 80-bit virtual addresses. Needless to say, the wide data path and additional address lines mean that the 620 is decidedly *not* pin-compatible with the 604. It has 482 pins, versus the 604's 304 pins. The 620 uses a BGA (ball grid array) package.

Features of the PowerPC 620

- 133MHz processor clock
- Half, third, or quarter-speed bus-interface clock
- 128-bit data bus
- 40-bit address bus
- 64-bit GPRs and FPRs
- 3.3V operation
- Seven million transistors
- 331mm² die
- Six execution units
- Split 32K caches
- Built-in level-2 cache interface

The PowerPC 620's bus interface includes integral support for a unified (that is, both code and data) level-2 cache, whose size is configurable from one to 128M. The cache-interface signals can run at the same speed as the processor clock rates or at one half or one quarter their speed, which allows the construction of a level-2 cache from slower RAM. This on-chip cache interface eliminates the extra clock cycles normally required to drive any external level-2 cache logic.

For a single-processor system, the level-2 cache interface improves performance by moving the data through the processor faster. In a multiprocessor system, the level-2 cache interface minimises bus traffic. It does so by using a bus protocol that's designed to be tightly coupled with snoop-response pipelining. This improves the rate at which addresses issue onto the bus, without latency of bus-snooping activity. The result is faster shared-memory access, which is vital in an environment where two or more processors exchange data or access shared semaphores and flags.

Inside the PowerPC 620, fetched code and data land in the internal 32K caches. The data cache supports both write-through and write-back modes and uses the MESI (Modified, Exclusive, Shared, Invalid) protocol to maintain cache coherency. On the code side of the street, instructions pass through a predecoder on their way to the internal code cache. The predecoded instructions reside in the code cache until the dispatch/completion unit fetches them.

Because of this up-front predecoding, the remaining decoder logic is merged into the dispatch stage of the processor pipelines. This effectively shortens the 620's pipelines from six stages to five (fetch, decode/dispatch, execute, complete, and writeback). The shorter pipelines mean that each instruction completes in fewer clock cycles, resulting in faster overall code execution.

Once fetched by the decode/dispatch unit, instructions are assigned a rename buffer that temporarily holds any instruction results, such as write to another register. The rename buffers make possible the speculative execution of instructions based on branch prediction, since an operation's results remain in this buffer until the outcome of a branch instruction is resolved. If the branch prediction is correct, the rename-buffer contents are written to the architectural registers. If not, the rename-buffer contents are discarded.

As with the 604, a 16-entry reorder buffer in the 620 tracks the status of an instruction from dispatch to completion. Significantly, the 620 can release up to four rename buffers per cycle, versus just two for the 604. This makes the existing rename buffers more readily available to other instructions in the pipeline. Furthermore, the shorter pipelines process instructions faster. The combination of these two features means fewer rename buffers are needed to store the intermediate results of speculative executions. Therefore, the 620 has only 16 rename buffers (eight GPRs and eight FPRs) in total, versus a total of 20 (12 GPRs and eight FPRs) for the 604.

Next, the decode/dispatch unit issues instructions to the six execution units. Up to four instructions are dispatched per cycle to the execution units. Each unit has two or more reservation stations, which act as temporary storage for those dispatched instructions that depend on the results of other instructions. The reservation stations thus keep the instruction-dispatch bus clear so that the dispatch unit can continue to issue instructions to other execution units. If there are sufficient reservation stations available, an execution unit that stalls because of code dependencies won't impede the instructions dispatch or the operation of those execution units (for example, the integer units) that can execute instructions out of order.

To this end, the PowerPC 620 has several more reservation stations than the 604: the 620's branch unit has four (versus two on the 604), and the 620's load/store unit has three, as opposed to the 604's two. The 620 provides in-order instruction dispatch and out-of-order execution. The reorder buffer weaves the instruction results together so that instructions ultimately complete in program order.

Like the PowerPC 604, the 620 implements dynamic branch prediction. But the 620 has a more aggressive branch-prediction logic that can speculatively execute up to four unresolved branch instructions, versus only two on the 604. To accomplish

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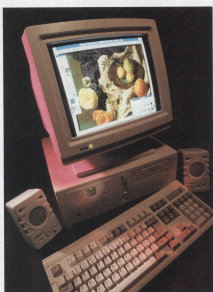
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Simulations run by the PowerPC's designers show that the branch-predication logic is 90 per cent accurate

this, the 620 uses a larger 2048-entry BHT (branch history table) that records and tracks the usage history of each branch instruction encountered. Also, the 620 has a larger, 256-entry BTAC (branch-target address cache) in which it caches the instruction and target addresses. By contrast, the 604's BHT holds 512 entries, and its BTAC has only 64 entries.

Simulations run by the PowerPC's designers show that the branch-predication logic is 90 per cent accurate, which translates to little or no execution delays on program branches most of the time. In those cases where a bad branch prediction occurs, the penalty for recovering the thread of execution is typically four clock cycles. On the first cycle, the PowerPC 620 completes all instructions up to and including the branch and calculates the address of the correct branch path. (This operation sometimes takes more than one cycle.) The second cycle flushes the pipelines and fetches the correct instructions. The third cycle dispatches the instructions; the fourth cycle executes them.

Fast floating-point performance and modes

The 604's PC-based design emphasises integer performance, as dictated by the needs of its applications. But workstation applications anticipated to run on the 620 — such as data capture and visualisation, scientific simulations, and real-time analysis of market trends — make heavy use of exotic equations to compute thousands of results per second. Thus, they require rip-roaring floating-point performance.

As the SPECmarks mentioned at the beginning of this article indicate, the 620 easily serves up floating-point performance that's much better than its integer performance. The PowerPC's designers achieved this by implementing key improvements in certain execution units and by fine-tuning the RISC core's throughput.

In the 620's FPU, the engineers worked to improve the speed of the divide (**fdv**) and square-root instructions (**fsqrt**). The divide instruction is a computationally expensive instruction and is used frequently, so any enhancement in its execution speed has an impact on all floating-point computations. The engineers decided to also speed up the square-root instruction because of its high frequency of use. The **fdv** instruction, which takes 32 clock cycles on the 604, takes just 18 on the 620. The **fsqrt** instruc-

tion, which was emulated in software on the 604, now executes in 22 clock cycles. For the load/store unit, one clock cycle was shaved off floating-point data accesses.

All these improvements add up to better floating-point throughput. However, the designers obtained the most significant performance gains by engineering the processor to get data through the RISC core faster. The PowerPC 620's wider data paths, shorter pipelines, on-chip caches, and level-2 cache support all contribute to shipping large amounts of floating-point data in, through, and out of the FPU.

Over time, 64-bit application's will be written to take advantage of the huge address space the 620 offers. To this end, the 620 implements 38 new instructions as part of the 64-bit PowerPC architecture. Specific 64-bit instructions that such applications might use are load/store instructions that access long words of data, such as load doubleword (**ld**) and store doubleword (**std**). For compatibility with the existing base of 32-bit PowerPC applications (such as it is now), the 620 can execute them without modification.

A mode bit in the processor's MSR (machine state register) indicates which mode the PowerPC 620 operates in (32 or 64-bit). There's no penalty for running the processor in either mode; in 32-bit mode, the bits in the lower half of the 620's 64-bit registers are guaranteed to correspond to those in a 32-bit PowerPC processor. Furthermore, the mode bit in the MSR is under software control, so it's possible for a 64-bit operating system to change the processor environment on-the-fly to execute 32-bit applications. There would be some overhead on the part of the operating system to manage the mode switch.

One unique feature found in all PowerPC processors — but which the 620 should be able to put to good use — is the ability to assume either big-endian (Motorola) or little-endian (Intel) address modes under software control. One bit in the MSR determines the addressing mode; another bit indicates the addressing mode of an interrupt handler. This lets a big-endian operating system run little-endian applications. When a hardware interrupt

occurs for an operating-system service, the addressing mode can be switched to big-endian for the duration of the interrupt handler's execution. A 620-based workstation could thus host application code from different operating systems (say, a Unix operating system running Windows applications) with respectable performance.

Future directions

The PowerPC 620 is a promising addition to the PowerPC family of processors, offering workstation-class throughput and paying special attention to floating-point performance. Its speed and power consumption are comparable to those of other RISC processors. However, processing speed is always a moving target in this fast-paced business: By the time the first 620-based system appears in the latter half of 1995, we'll be witnessing the first silicon on a new generation of faster chips from other RISC vendors.

While the 620 is the last of the publicly announced processors, the Somerset engineers are busily working on next-generation processors and enhancements to existing designs. The PowerPC alliance is understandably quiet about information on future processors, but its efforts to enhance existing designs are already well known, as is evidenced by the 601+.

In the 601+ processor, a 0.5-micron, five-metal-layer, local-interconnect process shrinks the die size from the original 121mm² to 74mm². It also reduces the operating voltage from 3.6V to 2.5V, so the 601+ dissipates 4W at 100MHz. This is half the power consumption of the original PowerPC 601 operating at 66MHz, and close to the maximum output of the PowerPC 603 (3W at 80MHz). Expect similar improvements to appear in the PowerPC 603, 604 and 620 designs.

Key to the PowerPC's future survival is its acceptance by users. Initial activity in this area, though limited, is promising. The only PowerPC-based systems on the market at this writing are Apple's line of Power Macs, which use the PowerPC 601. Apple sold over 345,000 of these systems in just four months, becoming the largest RISC-computer vendor on the planet. If this trend continues, especially when high-speed PowerPC 603, 604 and 620-based systems from Apple, IBM, and other vendors appear, then the alliance's hopes of creating a new standard for desktop computers might succeed after all.

The 620 easily serves up floating-point performance that's much better than its integer performance.

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T5: brute force

Mips Technologies' T5 chip takes an aggressive approach to superscalar dispatch that shows how far today's engineers must go to deliver cutting-edge performance.

By Tom Halfhill

Microprocessor design is a never-ending cycle of eliminating bottlenecks and thereby creating new ones. When CPUs outran the ability of memory chips and I/O buses to keep them fed with instructions, the solution was to widen the bus, add high-speed caches, and simplify the instructions so that they took less time to process. When the resulting instruction stream surged beyond the capacity of the core, the answer was to deepen the execution pipeline and add multiple functional units with parallel pipes. Then I/O became a problem again, leading to even wider buses and larger caches. And so it goes.

This tug-of-war between bandwidth and horsepower won't end until all known techniques are exhausted or the cost of diminishing returns becomes prohibitive. Even though that wall isn't yet in sight, today's CPU architects are turning to increasingly radical architecture in their quest for leading-edge performance. Witness the new fifth-generation Rx000-series processor from Silicon Graphics/Mips Technologies.

The chips code name is T5, or the Terminator — referring to the 1991 movie *Terminator 2: Judgement Day*, with its Oscar-winning special effects, which were created with Mips-powered SGI workstations. The T5 is based on the same fifth-generation superscalar RISC technology introduced earlier this year in the Mips R8000, a supercomputer processor. But while the R8000 is a multichip module optimised for high-end scientific calculations, the T5 is a general-purpose single-chip processor for desktop PCs, workstations, and servers. It offers a better balance between integer and floating-point performance than the R8000, making it more suitable for mainstream applications. The T5 is designed to be equally at home in PCs running Windows NT, workstations running Unix, or multiprocessor servers for transactional databases.

As the first single-chip superscalar processor from Mips, the T5 represents a significant step forward for the Rx000 architecture. Behind it is a strong RISC heritage — the original R2000 in 1985 was the first commercially available RISC chip, and one of the Mips founders was John L. Hennessy, a pioneer researcher in RISC technology.

The T5 builds on preceding generations (R2000, R3000, R5000 and R4000) by incorporating five functional units, twice as much primary cache as the R4400, twice as many registers, dynamic-register renaming, dynamic-branch prediction, speculative execution, out-of-order execution, and multiprocessor support for up to four CPUs on a special cluster bus.

At its initial core speed of 200MHz, the T5 is expected to deliver 250 SPECint92 and 350 SPECfp92 — and that's with R4000 binaries that haven't been optimised for the T5. Although not as fast as DEC's new Alpha 21164, the T5 offers a distinct price/performance



ratio advantage over the Alpha and the Pentium. It will keep SGI's graphics workstations competitive and maintain the price/performance advantage of Mips-based NT boxes.

Mips says the T5 is even faster than synthetic benchmarks indicate because its more tolerant of cache misses than other processors. The T5's ability to tolerate up to four misses without stalls should make it a particularly good CPU for busy database servers, because transaction processing is I/O-intensive and requires huge secondary caches to avoid the penalty of frequent misses.

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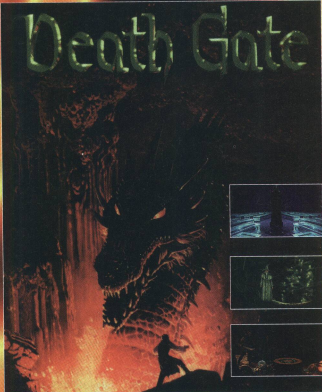
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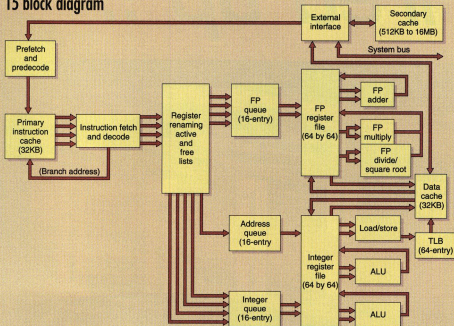


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T5 block diagram



The Mips T5 is a cross between a four-way and five-way superscalar design. It can fetch up to four instructions per cycle, dispatch up to five instructions to its five execution units per cycle, and graduate four results per cycle. It supports out-of-order execution, branch prediction up to four levels deep, speculative execution and dynamic-register renaming.

Beyond brute force

By far the most impressive features of the T5 are its high degree of parallelism and dynamic instruction scheduling. The goal of this design is to combine the brute force of multiple functional units with the finesse of speculative, out-of-order execution.

Previous R3000-series chips had scalar pipelines that always executed instructions in their original program order. In contrast, the T5 has five independently pipelined functional units, each of which can execute and complete one instruction per cycle without regard to program order. Furthermore, the T5 can predict the outcome of branches and speculatively execute the code that follows. Only when all dependencies are resolved are the results of the completed instructions retired (or *graduated*, in Mips parlance) and restored to their original sequence. Up to four results can be graduated per cycle.

Out-of-order execution is an increasingly common technique for managing the growing resources of advanced microprocessors. Brute force in the form of higher clock speeds, wider buses, larger caches, and more pipelines has its place but also its limits. Soon you reach a point of diminishing returns where the functional units are stalled because they don't have enough to do. Optimised compilers try to address this problem by reordering the

instructions to take advantage of a particular CPU's requirements.

In effect, out-of-order execution is a partial substitute for optimised compilation, because it shifts the burden of instruction ordering from the compiler (or the assembly language programmer) to the CPU itself. The CPU, not the compiler, rearranges instructions to match the availability of resources — and it does so dynamically at run time, not statically at compile time.

If this technique is carried far enough in future designs, optimised compilers and hand-tuned assembly language may become as obsolete as punch cards and toggle switches. The T5 doesn't go quite that far, but it does represent the state of the art, matching or exceeding the sophistication of dynamic issue in DEC's Alpha 21164, IBM/Motorola's PowerPC 620, AMD's K5 and Cyrix's M1.

Wall-to-wall superscalar

Mips isn't taking a tentative step toward superscalar with the T5; this chip is thoroughly parallel from front to back (see the figure 'T5 Block diagram').

Each cycle, the T5 can fetch four 32-bit instructions from its 32K, two-way set-associative instruction cache, or I-cache. Not only is that cache twice as large as the R4000's, but its two-way set-associatively is also an improvement over the R4000's

direct mapping, yielding an effective 4x increase in cache efficiency. An on-chip controller supports a secondary cache ranging in size from 512K to 16M, which is also two-way set-associative.

Cached instructions are actually 37 bits long, because five extra bits are appended during a predecode stage when the instructions are prefetched into the cache. The extra bits assist full decoding by classifying the instructions according to various attributes and by preassigning them to execution units. This prefetch/predecode stage is not counted as one of the main pipeline stages.

After the instructions are fetched from the I-cache, they pass through a two-stage decoder. Actual decoding takes only one stage, however; the second stage is for register renaming.

Dynamic-register is a way of expanding a processor's register file without jeopardising software compatibility. While previous Rx000 processors had 32 integer and 32 floating-point registers, the T5 has 64 integer and 64 floating-point registers, all 64 bits wide. In each of the 64 physical registers, any of the 64 physical registers can be dynamically renamed to point to the architectural register file of the processor. Thus, programs can see only 32 registers, but the processor has twice as many registers for internal values.

This technique is critically important for speculative and out-of-order execution, because it allows the T5 to store intermediate results and speculative results in the 'invisible' registers. The results then become visible to the program when all dependencies have been resolved and the speculative paths have been validated.

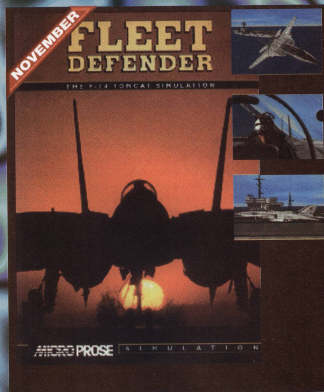
To keep track of what's going on, the T5 maintains an *active list* of occupied registers and a *free list* of available registers. Registers on the active list can have two states: active (that is, currently in use by an executing instruction) or completed (that is, the final result of an executed instruction). Up to 32 instructions can be active at a time. After a completed result is graduated and no longer needed, the register is removed from the active list and added to the free list. Speculative execution can continue as long as free registers are available, and register renaming takes only a single cycle.

Register renaming also plays a crucial role in branch prediction. It's part of a clever mechanism that lets the T5 quickly

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"There is less need to recompile for the T5 than there is for a classic superscalar. The hardware is doing a lot of what compilers sometimes had to do."

abort a speculative path if a branch was wrongly predicted.

Here's how it works. The T5 speculates on every branch, up to four branches deep. At each of these junctures, the T5 takes a snapshot of the register states—what Mips calls a *shadow map* of the register-*rename* map as it existed at the moment. If it later turns out that a branch was mispredicted, the T5 doesn't have to flush any buffers or clear any registers. It merely restores the appropriate shadow map as the working register-*rename* map and then adds any registers holding invalid results to the free list. This takes only one cycle.

Therefore, the penalty for mispredicting a branch varies from one to four cycles, depending on when the T5 realizes it has guessed wrong. The worst case is when the T5 pursues speculative paths through four nested branches and then discovers in *reverse order* that it mispredicted each one. Usually, however, the oldest mispredicted branch in a series will be discovered first, because the CPU has had time to execute more instructions along the speculative path to which it leads. In that case, the penalty for aborting all four branches is only a single cycle. Any branches that follow an invalid branch must themselves be invalid, so the T5 just restores the shadow map for the oldest valid branch in the speculative tree.

Branch prediction is also dynamic, adapting to the program as it runs. The T5 records the history of each branch by setting a 2-bit flag that defines four possible states: strongly taken, weakly taken, weakly not taken, and strongly not taken. Accordingly to Mips, the T5 correctly predicts branches more than 90 per cent of the time—a significant factor in real-world performance, because the integer code typically found in mainstream application averages a branch every six instructions.

Five-way execution

Even though the T5 can fetch four instructions per cycle and graduate four results per cycle, it has five execution units in between. Potentially, instructions can be issued to all five units at once, and each unit can execute and complete an instruction every cycle. The T5 is therefore something of a cross between a four-way and a five-way superscalar processor, but that apparent mismatch is no accident. By providing more peak bandwidth in the

core, the T5 can allocate its resources more efficiently and has more headroom for future growth.

Functional units include two ALUs for integer instructions a load/store unit, and two FPUs—one for addition and another for multiply/divide/square root calculations. The latter FPU is actually a pair of sub-units (a multiplier and a divider/square root) that share the same issue and completion logic. They can execute single or double-precision division and square-root operations in parallel.

The two ALUs are nearly identical, but one can handle integer multiplication/division (in multiple cycles) and the other has some logic for verifying predicted branches that depend on integer register values. The load/store unit handles all address calculation and translation, and it can calculate one address per cycle. It translates 44-bit virtual addresses into 40-bit physical addresses using a 64-entry, fully associative TLB (translation look-aside buffer). Each TLB entry can address two pages ranging in size from 4K to 16M.

All five pipelines have the fetch-decode-*rename* stages described above, as well as at least one execution stage. Counting the graduation stage at the end, therefore, the minimum pipeline depth is five stages.

Instructions remain in program order as they pass through the first three stages. Then they enter a trio of queues to await issue to their appropriate execution units. Each of these queues (one for the ALUs, one for the FPU and another for the load/store unit) has 16 entries, and they can issue from any position in the queue. In other words, this is where the instruction stream starts to deviate from original program order.

Under certain conditions, the T5 can issue up to five instructions per cycle from these queues. In most cases, however, it will issue one to four instructions, depending on the instruction mix.

As usual for a RISC chip, the vast majority of instructions execute in a single cycle. Single or double-precision floating-point multiply, add, subtract, compare, and convert operations require two cycles, although multiplications need a third cycle to transfer the result. More complex floating-point instructions that are computed iteratively may consume numerous cycles.

Load operations require two cycles if they hit the data cache, and they can be

executed speculatively and out of order. This is important because loads account for about 20 per cent of all instructions, and the speculative execution of other instructions will screech to a halt if they depend on data that isn't available yet.

This also explains why Mips doubled the size of the data cache, from 16K in the R4000 to 32K in the T5. A heavily pipelined processor like the T5 can gobble data at a prodigious rate. The cycle times of memory and microprocessors were about the same 10 years ago; today, we have 60ns DRAM mated to screamers such as the T5, which at 200MHz has a cycle time of only 5ns. And because the T5 graduates up to four instructions per cycle, at times it's equivalent to a scalar CPU running at 800MHz.

During the final pipeline stage, completed instructions aren't allowed to graduate until any dependencies are resolved and speculative paths are verified. The T5 also maintains precise exceptions: any completed instructions following the instruction that caused the exception aren't permitted to graduate, either.

During graduation, physical registers are renamed as logical registers to validate their results, and the oldest completed instructions always graduate first. This restores the instruction stream to its original program order.

Mips dynamics

As long as the T5 doesn't trigger an exception, mispredict too many branches, run out of free registers, overflow its queues, or miss the cache, it will deliver something close to its peak throughput. Although that seems like a lot of ifs, simulations indicate that the T5 is very efficient. As with all CPUs running real-world software, it spends a fair amount of time recovering from cache misses, but when everything clicks, the pipelines gush oil. Mips says that existing R4000 binaries appear to run almost like optimised code, a tribute to the effectiveness of the T5's dynamic scheduling.

"There is less need to recompile for the T5 than there is for a classic superscalar," says John R. Mashey, director of systems technology at Mips and one of the 90 engineers who designed the T5. "The hardware is doing a lot of what compilers sometimes had to do. When you're designing a compiler for a classic static-issue superscalar, you sometimes work real hard to arrange things like moving loads and branches further apart, being careful not to have two loads in a set of a couple instructions, because you know the chip is only going to single-issue. Here, you just kind of don't care." ▲

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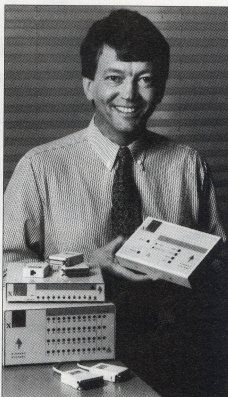
To your computer it still looks like it has a printer plugged directly to it just like before; there is no reconfiguration.

GREATLY IMPROVE PRODUCTIVITY

Because everyone has their own full parallel speed connection direct to the Super Q. And because the Super Q can have up to 8 Meg of buffer, everyone can send at the same time even if the printers can't keep up. This is terrific if anyone is doing graphics work which would quickly bottleneck other systems.

ULTRA RELIABLE 'TFT'

TFT is the transmission mode between the Transmitters, Receivers and the Super Q. The parallel data is transformed into a 'Network Like' data stream which is immune to electrical interference and ground currents. No problem with running cables near power cables or electrically noisy equipment with TFT. It also provides a 400VRMS electrical isolation between all connections which means you are not introducing a potential hazard by connecting many computers and peripherals together. These are key advantages which no other printer sharing system has and although TFT is technically sophisticated, to the user, the system is simple and trouble free.



The inventor of 'TFT', the advanced new technology used in the Super Q Printer Sharers – Yukka Tuisku

Winner of the
1993 Australian
Hardware Commendation



A REAL NETWORK ALTERNATIVE

The Super Qs are low cost and can integrate work groups without all the setup and support requirements of networks. For PC co-ordinators this is a big plus; you can confidently send Super Qs to remote sites because the users can easily do the installation themselves.

ALL AUSTRALIAN

TFT and the Super Qs are 100% Australian invented, designed and manufactured. Now you can support Australia's balance of payments and get the best in printer sharing as well.

TFT – is proven technology that eliminates electrical interference giving you error free data transfer and safe equipment.

SUPER Q FEATURES

- from 4 to 32 computers can share 2 to 16 printers
- transmitters and receivers are truly unpowered
- high speed data transfer, 30K bytes/sec; 650 pages of text per minute
- buffer up to 8 megabytes
- inexpensive 4 wire telephone cable or any existing cable
- UTP cabling used in PDS wiring is ideal
- up to 300 metres cable length per connection
- DOS and Windows compatible
- designed and made in Australia giving you direct access to expert advice and service.
- 3 YEAR WARRANTY



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Gives you plenty of time to fully operate and test the system to your satisfaction – which means your investment in a Super Q is no risk.



DIAMOND
SYSTEMS

MULTIMEDIA KIT OUT



A worldwide multimedia market worth \$4 billion by 1997. More than a million multimedia-capable PCs in Australia by the end of next year. For those whose PCs still burble and squeak, APC surveys a range of multimedia kits for performance, compatibility and value for money.

Back in June we conducted a technical analysis of the two component technologies of mainstream multimedia — sound cards and CD-ROM drives. In this month's roundup, we adopt a consumer focus and survey retail-oriented multimedia kits and bundles.

APC invited vendors to provide the

retail multimedia solution they considered best represented their product ranges. We received nine kits from eight vendors. All were based on 16-bit sound cards and double-speed CD-ROM drives, although beyond these basic specifications they varied widely in content and capability.

Our Labs team conducted the eval-

uations on an AST Advantage system with a 486DX2 50MHz processor and 8M of RAM equipped with Windows for Workgroups 3.1 and MS-DOS 6.2. Before testing each kit we reformat-
ted the hard drive and re-installed all necessary system files.

BY STUART BOWMAN

Installation

Installation varied from simple one disk operations to traumas requiring ingenuity and guesswork.

In general the easiest kits to install were those bundled as a one-box multimedia solution. There's an appealing synergy in single step software installation and preconfigured jumpers!

Kits comprised of separately packaged CD-ROM units and sound cards were typically harder to configure, necessitating separate installation procedures for each component. Separate sound cards, for example, often have CD-ROM drive functions disabled and interrupts unset.

While all kits installed DOS drivers into vanilla AUTOEXEC.BAT and CONFIG.SYS successfully, several had problems with either multiple boot configured systems under DOS 6.2, and especially under Windows, requiring manual updates or install.

Documentation quality still varies far more than it should — from obscure through to excellent — with the one-box solutions again outstripping the separately packaged bundles for ease of comprehension. Bowman's Law: the more variables in the configuration the more obscure the documentation.

One alleviating approach was that used with the AudioWave Powermedia kit, which included a 12-minute video covering both the hardware and software.

Fortunately, no one included a multimedia demo of how to set up their kit.

What you get

All kits reviewed adhere to the Multimedia Marketing Council's MPC level 2 standard — 486 or better processor, 4M RAM, 160M HDD, 16-bit stereo sound card and a multisession XA-Ready double-speed CD-ROM. This really should have been the level 1 spec. For enjoyable multimedia usage, you want a DX/33 or better with local bus drive and video, at least 8M of RAM (and increasingly apps are asking 12M), and a 300 to 400M drive. For even basic multimedia authoring, 16M of



■ Office applications: SoundBlaster Multimedia Office

■ Home entertainment: Media Vision Super Deluxe MV-3000 Kit

● Retailing for just \$999 the SoundBlaster Multimedia Office offers phenomenal value, combining one of the best mainstream multimedia kits on the market with the full Microsoft Office Professional Suite on CD, Microsoft's excellent multimedia encyclopaedia Encarta, and software that is claimed to have a total retail value over \$2000.

The SoundBlaster 16 is equipped with DSP chip for on-card decompression of files, and a programmable ASP chip offers increased versatility and the ability to download algorithms such as QSound, reverb and echo to the chip.

RAM, a 500M or better drive, and a DX2/66 are baselines.

All of the sound cards reviewed were based on FM synthesis capable of 16-bit stereo sampling rates of 44.1KHz or greater. The majority of the cards were also based on the Yamaha OPL3 synthesiser and capable of four-operator 20-voice reproduction.

The SoundWave32 was the only card to include a built-in Wave Table. On many of the cards this was an expensive upgrade option. With the increasing number of games that allow you to differentiate between digital FM synthesis and the MIDI musical score, this allows you to have the best of both worlds — a must for any serious gamer. Unfortunately, the FM synthesiser on the SoundWave32 is capable of only two-operator operation.

The better cards used Digital Signal Processing (DSP) chips. These allow the card to process algorithms locally without the need to tie up the CPU. Depending on how advanced the DSP chips are, other effects such as reverb and echo can be added at the local hardware level. One of the most advanced implementations of the DSP chip is by the Creative Labs SoundBlaster 16 with Advanced Signal Processing (ASP).

Creative's own utilities (including VoiceAssist, TextAssist and Windows Sound System 2.0) are high quality, as are the included microphone and headset.

● The Media Vision Super Deluxe MV-3000 includes 15 CD titles, nine of which are educational or aimed at kids. The remaining titles are consumer titles or adventure games, but together this makes a strong mix of software geared for education and fun. To match the content, the kit is easy to install, and the documentation is excellent. The kit also includes a lapel style microphone and amplified speakers.

In an effort to cram more into a spec table, products are being released that claim to increase the spatial soundscape through 180 to 270 degrees. Both AudioWave and LaserWave sound cards offer upgradability to 3D sound via a module. The module gives a cinema-like effect to the sound on your PC. Not surprisingly, these two cards look very similar. Rather than just being a hardware add-on, SoundBlaster is proposing a new standard, Q-Sound. QSound takes advantage of the ASP chip and allows software written to QSound specs to take advantage of increased spatial relationships.

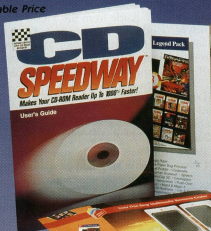
Standard on nearly all the cards reviewed were multiple CD-ROM interfaces for Sony, Panasonic and Mitsumi drives. If you are buying a sound card now and a CD-ROM drive later then this is probably a good idea. If you are buying the two together — and the devices are matched — then chances are you will never take advantage of the extra interface options.

Many of the CD-ROM drives bundled had a striking resemblance to each other. Be wary of retailers referring to drives as SCSI, as very few drives for under \$1000 are actually SCSI based.

Unlike the CD-ROM drives of

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It comes from Media Depot, America's fastest moving company in Multimedia with a board manufactured by Creative Technology, of Sound Blaster fame.

And just look at what it offers!

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a year ago none of the reviewed drives used any form of caddy, preferring instead open tray designs. These were mostly motorised with only a few requiring manual insertion. The better tray mechanisms use a positive action spindle to secure the CD. This removes the potential for damage to CDs from incorrectly loaded disk trays.

When it comes to adding peripherals each vendor likes to try and out-specify the other with items such as lapel mikes, ergonomic mikes, external and amplified speakers. If you intend to use an external stereo amplifier forget about the speaker issue altogether, and similarly with recording. In any case, ensure that the speakers shipped with your system of choice are shielded and amplified. Of kits shipped with amplified speakers, only the Reel-Magic package included a power pack adaptor. If you intend to use the system for business audio applications, ensure the microphone picks up vocals reasonably.

Software

When it comes to comparing a system with 15 titles against a system with nine, take time to evaluate the quality of the individual applications. How relevant are they to you? Some of the kits reviewed have extensive software libraries that they throw at you, others are best thrown back.

Unfortunately many of the games that promote interactive real life multimedia characters look and sound great but lack game play. Typical examples of these are games that are based around movies. Once all the song and dance is over and the film clips have run their course you are left with a game that is about as thrilling as playing chess against your pet dog.

At the other end of the spectrum, children's interactive cartoon stories are what home multimedia is all about: learning and being entertained.

In an effort to target this home market, kits like the Media Vision MY3000 are aimed at families with both young and teenage children. These kits are packed with educational games and reference libraries that would make any parent's credit card feel nervous. Software that is always popular in these bundles are Microsoft Encarta and interactive encyclopedias from either Compton or Grolier. These capture an endless wealth of information and can instantly make shelves of general reference books obsolete.

To fill the rapidly growing home office market, Creative Labs has put the Multimedia Office package together. For business audio applications a bundle like this would prove infinitely more useful than a pile of games or children's packages.

AcerMagic

The AcerMagic kit from Acer proved to have one of the most troublesome configuration setups in this roundup.

Like most cards, the AcerMagic used a single disk setup program. The program 'leads' you through a number of installation screens, and by the time you get to setting the hardware interrupts you feel more than a little lost.

Using the default installation in a machine that had no other I/O cards, the driver was not able to recognise the sound card. After fiddling with the settings we were able to get the card to run Windows audio — regardless of whether the driver recognised it or not. To complicate matters further the installation manual offers very little or no explanation for many of the jumpers and user settings.

Before being able to play audio CDs on the Music Centre, the bundled Windows audio utility, we had to manually install a Windows MCI CD driver. The Music Centre is easy to use and offers a basic set of features for playing wave and MIDI files and audio CDs.

When testing the card with some DOS-based games we had problems recognising the interrupt level chosen by the card.



Using Lucas Arts' CD, Rebel Assault, we were unable to get any sound at all. The card is compatible with SoundBlaster Pro, AdLib and Microsoft Windows 2.0 Sound System.

Incorporated onto the card are two CD-ROM interfaces — for Sony and Panasonic drives. The CD-ROM drive included is a double-spin Panasonic drive with a random access time of 320ms.

Using a wave table upgrade daughter

AT A GLANCE

Distributor: Acer

Phone: (02) 870 1999

Price: \$749

In short: Problems with configuring the card held it back from being the performer it should have been.

card the system is compatible with the Yamaha OPL4 standard with 24-voice capability.

Aside from the Music Centre the only other software included with the system is a Photo CD Viewer. The speakers are non-amplified and rely on the four-watt amplifier on the card for volume.

Stuart Bowman

Powermedia Kit

Aimed at the teenage market, the Powermedia MPC kit from AudioWave offers an inexpensive entry into high-tech software and multimedia applications.

The Powermedia kit includes an AudioWave Green16 soundcard and double-speed multisession CD-ROM drive. Essentially the two main differences between this and other similarly priced kits are the 25-watt amplified speakers and the five software titles that are included.

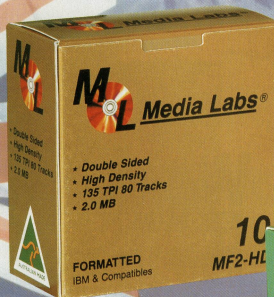
Unlike many of the kits the software selection does not include any educational games for growing kids. Instead it offers Comanche Maximum Overkill, MegaRace, Return to Zork, Mayo Clinic Family Health Book and Compton's Interactive Encyclopedia.

Comanche is an excellent helicopter simulation game in its own right, however, both it and MegaRace have a destructive element. For an adventure style game Return to Zork goes one step further by introducing full speech and reasonable quality video images.

The Mayo Family Health Book and Compton's Interactive Encyclopedia are a wealth of information. They both exploit the multimedia interface and make learning fun.

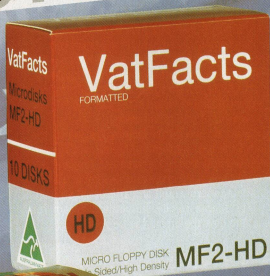
Many of the games that promote interactive real life multimedia characters look and sound great but lack game play.

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★ Home

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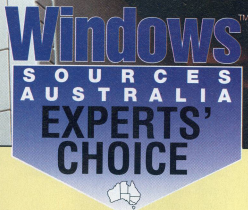
Look at the facts. Microarts has won more *Editor's Choice* & *Best Buy* Awards than any other Australian computer company. In the latest copy of *Windows Sources* (Oct '94) you can see how our P90 PCI 90MHz blew away the competition to win the "Experts' Choice" award again! Our P66 PCI also won the "Experts' Choice" award in the July Showdown. That's two out of two to Microarts!

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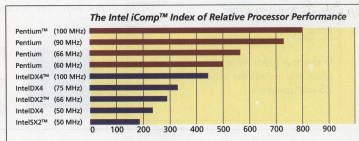
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The hardware is based around a SoundBlaster Pro compatible 16-bit sound card. This card can interface with either Sony, Panasonic or Mitsumi CD-ROM drives and can be upgraded to accept a SCSI drive. A DreamWave or WaveBlaster compatible daughter card can be added to the system providing superior wave table technology.

The CD-ROM supports both multisession and Kodak Photo CD standards. Buttons on the front of the unit allow for simple playback of audio CDs without the need to load additional software. For advanced control of the CD player and sound card a group of useful and not-so-useful Windows utilities are included with the system.

To aid in setting the package up a VHS

installation video is included. This 12 minute video explains in detail how to install both the sound card and CD-ROM units. It is unfortunate that not as much care was taken in the design of the installation software. Separate installation programs were required to install the CD-ROM and sound card drivers and utilities, a total of three disks.

Soon to be released from AudioWave is a new MPC kit that will be based around the Platinum16 card and a Teac quad-spin CD-ROM drive. It will include the same bundle of ap-

plications and hardware.

Stuart Bowman

Futura16 and

Nucleus16 CD-ROM Kits

ACS have put together a compilation of kits based around its range of LaserWave audio cards and brand name CD-ROM drives.

With two mainstream kits the user has the option of choosing the Nucleus16 with its power saving operation or the Futura16 with its enhanced features and upgrade potential (the Nucleus16 is an identical card to the AudioWave Green16.)

With the Nucleus16 you have the option of either a Panasonic or Sony CD-ROM drive. Packaged with the Nucleus unit is Microsoft's Encarta and included with the Sony is Microsoft Works. The Futura16 does not have this option and comes standard

AT A GLANCE

Distributor: ACS

Phone: (03) 335 4100

Price: Nucleus16 Panasonic/Sony \$589; Futura16 Panasonic \$499

In short: The Nucleus16 kit is ideal for the home user wishing to use the card primarily for playing games or as a MIDI interface. For business audio the inclusion of the Microsoft Windows Sound System is a definite bonus.

with the Panasonic drive and Encarta. Both cards feature multiple CD-ROM interfaces for Sony, Panasonic or Mitsumi drives.

Suitable for most home users the Nucleus16 offers reasonable sound reproduction — at a cost that is lower than many competing 16-bit cards. The card is compatible with Microsoft Sound System, AdLib, SoundBlaster and SoundBlaster Pro standards. Unfortunately this does not include compatibility with the SoundBlaster 16 card. To take advantage of the 16-bit capabilities of the card the system comes shipped with a bundle of basic Windows utilities.

The Futura16 is the big brother to the Nucleus16 card. Like the Nucleus16 it can also be upgraded to use a WaveBlaster compatible wave table. The Futura16 has the advantage of an optional add-on daughter card which provides hardware based 3D surround sound. With support for A/u-law and ADPCM standards the

AT A GLANCE

Distributor: Multimedia Technology

Phone: (03) 853 6700

Price: \$595

In short: A great value kit — especially when you include the extra CD titles and 25 watt speakers.



For advanced control of the CD player and sound card a group of useful and not-so-useful Windows utilities are included with the system

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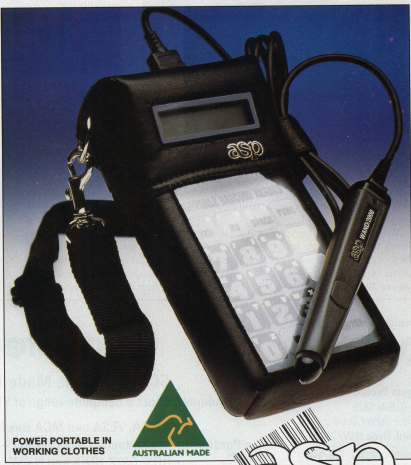
That's sometimes how it is with computers too. Take portable data collection. You could lug your notebook or palmtop, but with its clamshell case and limited battery life, it wouldn't be durable or convenient.

ASP's POWER PORTABLE Barcode Reader is. This tough Australian made tool delivers rugged hand-held and programmable power, with barcode reading capability, and very long battery life. Programs are simply written on a PC in ASP BASIC and downloaded to the POWER PORTABLE along with data if required. The user can be prompted by the POWER PORTABLE's LCD screen, and keyboard entries made as required on the large easy to use keys. The POWER PORTABLE can use barcode Wands or Guns, operate Printers and Modems, and has a special Australian Made protective leather case available as an option. Downloading is simple, either emulating the PC's keyboard in 'wedge' mode, or RS232. The POWER PORTABLE can even be used as a fixed barcode reader, saving investment in additional equipment.

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Media Magic Multimedia Kit

The Media Magic kit from IPC was a joy to install. It featured a dual-speed CD-ROM, 16-bit MPC level 2 compliant sound card and a pair of amplified speakers.

Unlike the majority of kits in this comparative review, the Media Magic kit is a hardware-only solution. Although the box in which the kit shipped claimed to have 10 CD-ROMs — including the World Fact Book and DOOM Episode 1 — IPC confirmed that it does not ship in Australia with these titles.

Installing the kit took only 15 minutes, with alterations to jumper settings unnecessary. Software installation is completed in just a few steps through which users are guided by the setup program. The option of installing from Windows or DOS is given, although the manual recommends Windows. This method is straightforward; the procedure configured the card for both SoundBlaster and Windows and added the necessary commands to mount the CD-ROM on boot. The installation utility not only sets up the card

but also adds the Windows Voyetra software that includes a media player, mixer, recorder with wave editor and Sound Script, a basic authoring utility.

The CD drive, a Sony CDU-31A/03, combines a dual-speed transfer rate of 300K/sec with a 64K buffer. While the drive offers the convenience of tray loading, rather than caddy, the mechanism is not motor-



card is capable of real time decompression. Aimed at those who intend to use the kit for business audio applications the system includes Windows Sound System 2.0. These utilities support object linking and embedding and provide an interface for controlling the audio capabilities of the system.

Based on either the Sony or Panasonic drives the LaserWave kits offer an affordable, no frills means of obtaining multimedia capabilities for your PC.

Stuart Bowman

AT A GLANCE

Distributor: IPC

Phone: (03) 428 8766

Price: \$595

In short: The Media Magic kit is an easy to install hardware-only multimedia kit.

used. After loading, the tray must be clicked back into place by hand. The drive, compatible with Kodak multisession photoCD, audio, red-book, yellow-book and High Sierra formats, sports self-cleaning lenses.

The ISP-16 audio board is compatible with a majority of mainstream formats including SoundBlaster, Adlib and Windows Sound System. This is an MPC level 2 compliant device and supports 8-bit and A/u-law compression. The card has configurable sampling rates from 5.5 to 48KHz.

Using the Yamaha OPL3 chip the card is capable of four-voice 20-operator FM sound. The half length card has interfaces for Sony, Mitsumi and Panasonic drives. An optional OPL4 wave table upgrade



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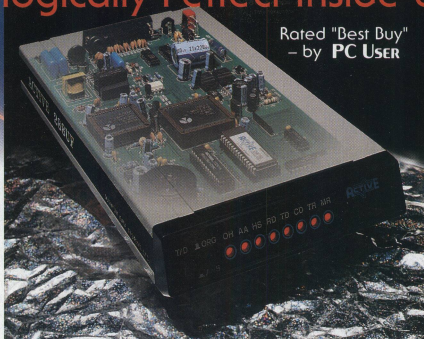
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COMING SOON: 3G CD-ROMs

A significant limitation of current CD-ROM standards is their inability to allow more than 70 minutes of compressed VHS-quality video on a disc. Several CD-ROM companies are preparing new video formats that, when combined with compression, will let you put more than two hours of full screen, full motion video with 16-bit audio on a disc. However, it could take more than a year before consumer-level products are available that conform to a proposed New High-Density CD System that's being developed by Philips and Sony.



Toshiba, Time Warner, and CD-ROM drive manufacturer JVC are also working on new formats. All three formats use similar techniques, such as an increase in the pit density and reliance on the MPEG-2 video compression standard. But drive vendors and medium producers have traditionally looked to Sony or Philips to set the standard.

The proposed standard's smaller track pitch presents a problem for the infrared laser used in CD-ROM drives today. Because the laser beams used in current CD-ROM drives are not narrow enough to read the smaller high-density CD-ROM pits in the new discs, existing players will not be able to read a New High-Density CD-ROM. However, Philips says CD-ROM players built for the new standard will read older discs.

Another area of concern is that of CD-ROM production. Philips officials say today's technology is capable of pressing higher-density discs, but mastering the discs is another matter. Philips says the blue lasers used for mastering might not be able to handle the new discs; it might be necessary to use narrower ultraviolet lasers.

Philips is negotiating with members of the CD-ROM, film, publishing, and game industries to reach consensus on the New High-Density standard. The company expected to have a proposal completed as we went to press.

**Michael Nadeau and
Bram Vermeer**

GLOSSARY: Audio performance

Frequency response indicates how well a board or speakers reproduce sounds ranging from deep bass to high treble. Ideally, the component should handle all frequencies from 20Hz to 20,000Hz uniformly. Such a frequency response curve, when plotted, would yield a straight line at 0dB (decibels, relative) or at 80dBspl (decibels sound pressure level) in this spectrum. For sound boards, however, a 2dB or so dropoff can be expected at 18,000Hz because of the sharp treble cutoff filter. The smaller the deviation from 0dB or from 80dBspl in this range, the better the sound reproduction. A level below -3dB for sound boards or 70dBspl for speakers is unacceptable.

The signal-to-noise ratio (S/N ratio) is the ratio, in decibels, of the maximum undistorted output of the board (the signal) and the inevitable electronic noise — mostly hum and hiss — generated by the board's own circuitry. At the background level where such noise occurs, the human ear does not perceive all frequencies equally. So a standardised A-weighting network has been developed to reflect the 'perceptible annoyance' value of electronic noise.

With digital sound equipment, **quantisation noise** serves as a more ac-

curate guide to residual noise than the usual S/N figures do. Quantisation noise is caused by the imperfect signal conversion from analog to digital or from digital to analog. It is measured in the presence of a signal and is reported as the number of decibels below the maximum signal. The lower the score (the larger the negative number), the better the sound quality. In addition to noise, distortion is a problem. The integrated circuit amplifiers of audio components generate unwanted harmonics that alter the timbre of the music signals passed through them. The total harmonic distortion plus noise (THD+N) is the total of all spurious harmonic frequencies (plus the noise) generated within the board; it is expressed as a percentage of the undistorted output signal strength. THD+N values that exceed 0.1 per cent are likely to be audible; they indicate that the component has less than optimal circuitry.

Channel separation is the degree to which left and right-channel signals remain distinct from one another. Ideally, channel separation (on which stereo effect depends) should be infinite, so that no signal whatsoever leaks from one channel into the other. Imperfections in excess of -50dB (such as -45dB) are likely to mask the beneficial effects of stereo imaging.

loaded automatically with additions made to all appropriate .ini files.

The SoundWave32 sound card is one of the few cards that supports both FM synthesis and MIDI wave table technology, without the need for an expensive upgrade daughter card.

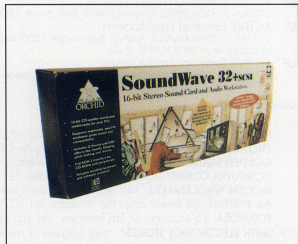
It offers the best of both worlds. FM synthesis for digital speech and a MIDI wave table for accurate reproduction of MIDI files. As games are already differentiating between the two, it is an inexpen-

sive alternative to having two cards. The SoundWave 32 is compatible with both Roland MPU-401 and MT-32 standards. With 8M of read only memory it has 128 stored instruments. A digital signal processor (DSP) allows the card to process decompression algorithms on the card. This alleviates the need to download decompression information to the CPU.

The CD-ROM drive has a double-speed transfer rate of 300K/sec and supports both Kodak PhotoCD and CD-XA standards. On the front of the drive are play and eject buttons. These allow you to play audio CDs without the need to load any additional system software. The play button also doubles as a skip button.

The bundled Windows audio utilities give you adequate control of wave and MIDI files, however it lacks the advanced interface that other products have to offer. The weakest point in this system is the four software titles that have been included.

Stuart Bowman



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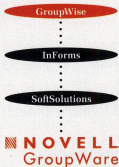
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Waiting for Windows 95

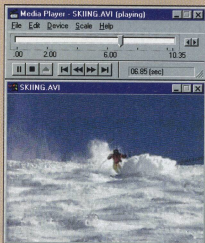
BY DAVID FLYNN

Windows 95, until recently known by Microsoft's code-name of Chicago, is the first PC operating system to fully embrace multimedia. It will be the next generation of hardware and software which will take best advantage of the DOS-less 32-bit OS, but even today's hardware and CD-ROM titles will enjoy the Windows welcome mat.

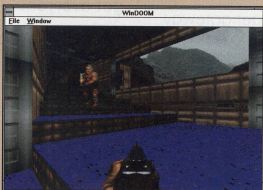
Plug and Play will be one of the biggest boosts for anyone installing multimedia hardware. Today, adding a soundcard or CD-ROM drive takes equal amounts of skill, luck and divine intercession from St Jude. The automatic detection and configuration of devices using Plug and Play (PnP) takes the hassle out of hardware, provided both the PC BIOS and the boards or drives are PnP-ready. Windows 95 will also include drivers for the most popular pre-PnP cards, so you can hang onto your old SoundBlaster Pro for a little longer...

Multimedia is as much about *WinG* Commander as it is about *Encarta*, so Microsoft is championing Windows 95 as a robust, exciting and dare we say it, 'radically cool' games platform. The new *WinG* (Windows for Games) library includes routines which let developers make the most of the 32-bit architecture and centralised input/output systems, right down to little things like Windows' new in-built joystick support.

CD-ROMs benefit from several key features. The first is a 32-bit CD-ROM file system (CDFS), which supersedes the troublesome CD extensions (MSCDEX.DLL) issued with Windows 3.1. An 'AutoPlay' feature will let Windows 95 detect whether that CD you've just slipped into the drive needs to be installed or is ready to play. And if you like some background music while you work, just



Windows 95 includes the latest version of Microsoft's Video for Windows digital video player.



What was the first game ported to Windows 95? Doom, of course!

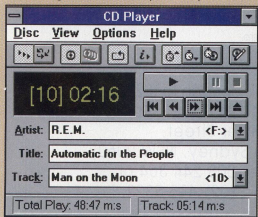
slide that Enya disc into the drive and run the Win95 CD Player. Other bundled applets include updated versions of the Sound Recorder and Media Player, plus a master volume control for on-screen adjustment of volume and balance.

Microsoft's Video for Windows is bundled with Windows 95, so you can

expect to see the AVI video file format become the de facto for general usage. The use of 32-bit digital video playback makes for larger, smoother and more colourful video. But don't throw away the old 16-bit stuff — 'The 32-bit improvements in file access speed and stream handling results in performance improvements even for 16-bit multimedia applications', according to Microsoft. Preemptive multitasking and multithreading should also make for faster, sturdier video.

Windows 95 also honours the latest MPEG standards and supports general MIDI, while 'polymessage MIDI' allows multiple MIDI instructions to be sent over a single interrupt, reducing the CPU drain and increasing speed and stability.

New codecs (compression/decompression algorithms) for voice and music will reduce the ratio of data to disk space, with an improved version of TrueSpeech (already included in the Windows Sound System 2.0) offering compression in the 8:1 factor. ▲



Win 95's bundled CD Player includes random/shuffle play and programmable playback.



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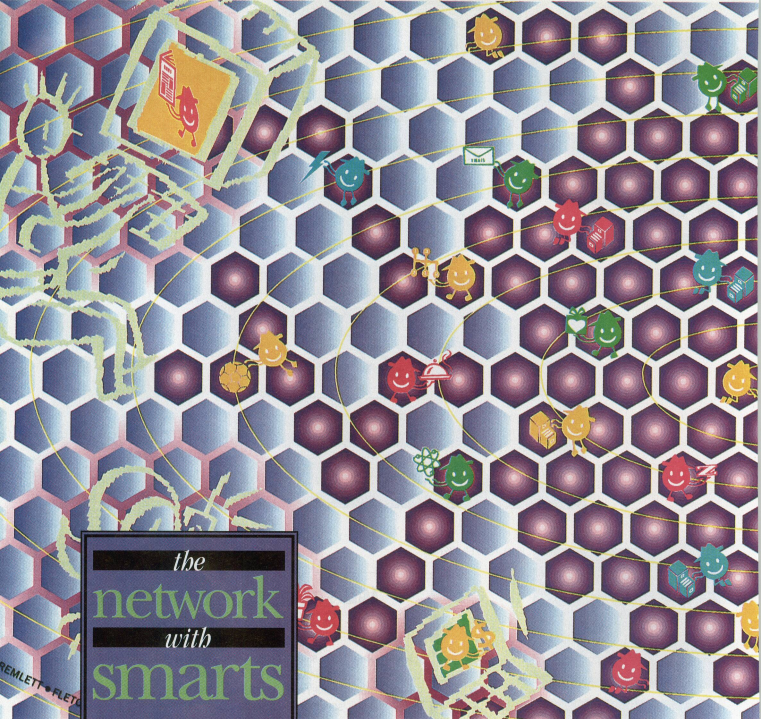
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Whether fronted by a character-mode or a graphical interface, or whether built on a mainframe, a Unix server, or a standalone PC, traditional online services and WANs share a basic assumption: bits travel from one end to the other over a dumb pipe. The minicomputers at the core of CompuServe, the desktop PCs and Macs calling America Online, and the laptops dialing into remote-access servers have all the brains, while the networks to which they attach know virtually nothing — other than the addresses of the sender and recipient — about the messages crossing their wires and waves.

All that, however, is about to change, as a new generation of 'smart' networks comes online. Drawing on the efforts of thousands of researchers and programmers in the telco, Internet, and online communities, General Magic, AT&T, and IBM are developing network services that will change the very definition of a WAN. Instead of being a mere conduit for applications executing at its endpoints, the network becomes a host for dis-

solutions. However, over time, agents will be an essential component of networks because they provide a flexible means of accommodating the exploding variety of devices and services.

Distributed intelligence

The emergence of the intelligent backbone is occurring in parallel with advancing capabilities at the endpoints of the network, such as LAN server-based telephony services, desktop telephony APIs, and more communications-enabled applications. In fact, a rivalry is shaping up among players (for example computer and peripheral makers, software companies and some phone equipment suppliers) who build advanced telephony products for the desktop and those companies (carriers, packet-network services, and some equipment suppliers) who want to push intelligence into the network itself and profit from increased fees and usage. The approaches are not mutually exclusive; some companies, such as AT&T, straddle both camps and stand to benefit in either scenario.

For example, one emerging software category is the 'universal inbox', a single place where faxes, email, and voice messages are collected and presented to the user. Apple first implemented such a capability in System 7 Pro, and Microsoft is building one into Chicago that, if used with services that support Windows TAPI (Telephony API), will handle all these message types. Third-party products are also available. But doing this task on the desktop is only one approach: carriers aim to support it as well in their networks, making messages accessible to a user from work, home, or on the road.

The mobile worker

No matter how widespread client-side telephony applications become, smart backbones are bound to flourish because of inherent technology and market shifts. One driving factor is the transition to mobility and wireless networking. Wireless links are more expensive, less reliable, and slower than land lines, so real-time connections are harder to maintain, and the exchange of rich media is impractical. Good wireless protocols tolerate interruptions and

quality degradation and are designed to connect, exchange brief messages, and sign off; store-and-forward messaging is thus the best solution for intermittently connected computing. Mobile devices, with their premium on size, weight, battery life, and low cost, also aren't well-suited to resource- and bandwidth-hungry RPC (remote procedure call) mechanisms. When you add the complexity (from a service provider's point of view) of supporting multiple devices (for example, a laptop, an organiser, a pager, and a cellular phone) per user, there's an obvious need for lighter-weight and more flexible architectures than traditional terminal processes, RPCs, and virtual circuits.

This is where agent-based networks shine, because they work well on connectionless, low-bandwidth infrastructures. Agents facilitate mobile attachment, relieve work from remote systems (permit-

ting them to be smaller and cheaper), and simplify interfacing with multiple devices and back-end services. Traditional WANs let you accomplish work only when you're connected or, if responsibility is pushed out to the client, require data reconciliation during connect sessions. Agent-based WANs, by contrast, let you inject a task into the network that executes whether or not you are connected. The agent operates continually, as near to the data as possible, minimising network traffic and reducing how much the user's system and the back-end service need to know about each other. When it has results to report or needs further guidance, the agent finds its way back to the sender.

A classic example is email filtering and routing. In a client-based implementation, the rules engine lives on your system, not on the network, so messages aren't processed or screened unless you are attached to your mailbox. In an agent implementation, the rules execute on the network when you're not connected, and your mail filter can even contact you via pager if you receive an urgent message. This scenario could be implemented as a conventional server process, but it would be network-specific and have to be programmed in advance. Agents permit greater flexibility; for instance, they could teach a server new message-handling techniques by injecting a mail-filtering method.

Don't write off the Internet

AT&T says it had to start from scratch to create a state-of-the-art network capable of supporting agents and agent-based applications, such as shopping and smart mail. While there's surely truth to this claim, it may be slightly self-justifying or merely a reflection of how radically the company had to confront its own cultural biases. It doesn't mean, however, that everybody has to start from scratch.

The most noteworthy example of a more incremental approach is the Internet, which is nothing if not resilient. People are now working to add technologies such as security, encryption, and agent-passing to the Internet, and someday it could offer functions similar to those of Personalink.

The most immediate option is CommerceNet, a set of commercial services built on top of the Internet. A group of organisations headed by Electronic Information Technologies, Stanford University's Centre for Information Technology, and the Bay Area Regional Research Network (BARRNet), with a membership that runs from companies like IBM, Intel, and Pac Bell to Citicorp and American Express, is promulgating standards and technologies to address the Internet's weakness in security, lack of billing capability, and need for a good user interface. Using RSA public key encryption, the Mosaic front end, and other widely supported technologies, the CommerceNet consortium aims to 'business-enable' the Internet and thus allow its commercial potential to be exploited. The key breakthrough is an enhanced version of the basic World Wide Web Hypertext Transport Protocol, called SecureHTTP, that will allow secure authenticated communication of information among Web clients and servers.

For agents, Safe-Tcl (Tool Control Language), a limited version of the Tcl scripting language for Unix, is emerging as an adjunct to the MIME (Multipurpose Internet Mail Extensions) email standard. Safe-Tcl scripts embedded into MIME messages can travel to remote systems and execute there with less risk of performing dangerous activities. Release 1.0's Jerry Michalski asks rhetorically, "Is [Safe-Tcl] Open Telescript?" He responds that while they are similar (robust and extensible scripting languages that use tunnelling), they are emerging from different cultures and have different front ends. Safe-Tcl builds on the extensive Internet infrastructure, whereas Personalink has to start from scratch.

New services

AT&T's Personalink and the as-yet unnamed offering from IBM Intelligent Communications Services are new agent-based systems. These services use different architectures from one another and aim at widely different audiences and applications; however, both provide an agent-based message-handling and information-delivery platform.

AT&T's Personalink, built around General Magic's Telescript technology, is an electronic community for email, information retrieval, and on-line shopping slated to become available, as we go to press, in the US. The network consists initially of centralised servers accessed by 800-number service or wirelessly through the Ardis packet radio network underneath Motorola's MNI service umbrella. Eventually AT&T

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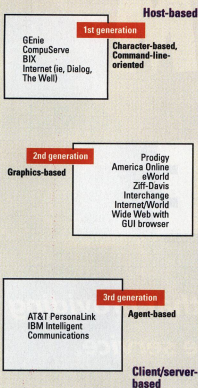
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The Generations of Online Services



The evolution of online services has mirrored general computer technology, from host-based to client/server, and from character-based to GUI and now to agents. In first-generation services, information came from the host, and all the work was done there except for local screen-rendering and locally maintained address books, message folders, and downloaded files. Second-generation services introduced GUIs and the exchange of graphics primitives; more computer power was presumed to be on the user's side of the pipe, and the architecture shifted subtly toward client/server. In agent-based services, roving software objects can conduct business on behalf of users even when they aren't connected to the network.

will add local-access nodes on a nationwide packet network, expand to distributed servers, and add service in other countries.

Using PersonaLink requires Telescript-enabled devices and 'Telescripted' software. At first, this means that only two devices will work with PersonaLink: the Motorola Envoy and the Sony Magic Link (see related story in Newsprint). Both are handheld computers (or Personal Intelligent Communicators) designed around General Magic's Magic Cap operating system, which has Telescript built in. Additional Magic Cap devices are expected to be introduced in 1995 by General Magic alliance members Philips and Matsushita, and perhaps eventually by Apple or AT&T. Also in early 1995, General Magic is expected to release Magic Cap software for Windows and the Mac OS, which will

make it possible for Macs and DOS/Windows machines to talk to PersonaLink.

IBM's ambitious service

IBM's Intelligent Communications service, slated to start up in 1995, is a different beast. It will be a communications 'super-service', a hub for routing and translating communications from one service and medium to another: desktop to mobile, PDA (personal digital assistant) to mainframe, email to fax, and text to speech. For instance, once it is fully implemented, you might send a cc:Mail message into the service from your desktop, use a wireless Newton in the back of a cab to view a fax, and then have the network read your IBM PROFS mail to you over a cellular phone. The sophisticated routing features would let you specify a scenario, such as "If I get a fax from Toshi regarding the Kyoto project, please run it through OCR and read it into my voice-mail box, send a copy of the text to Barbara, and forward the fax image to the optical-archive mailbox in the legal department."

Outside the Intelligent Communications cloud, IBM doesn't require new devices or protocols or applications; on the contrary, it welcomes and supports virtually any communications technology now in use. But inside the cloud, it uses an innovative agent architecture that isolates subscriber profiles and preferences from access devices and service providers, all under an aegis of centralized billing, security, and authentication.

These two services symbolize different concepts of the agent network. PersonaLink is an applications environment; a built-from-scratch messaging platform through which third-party content and service providers can deliver information, entertainment, and shopping. It is aimed at individual consumers, especially because it will be reached initially through the user-friendly Magic Cap interface. It's not meant as a message gateway, although it will support Internet and X.400 mail, fax, and paging. And while Telescript could someday become the lingua franca of wide-area communications, PersonaLink does not now support a diversity of access devices.

By contrast, Intelligent Communications is an umbrella for smart message routing, a giant gateway for consolidating wide-area communications among mobile professionals. It will relieve corporations of the considerable burden of creating and maintaining their own networks, but it's not an applications environment per se. User and service programs still execute outside the cloud, but they can become network-enabled by supporting Intel-

ligent Communications APIs and object standards.

In a sense, PersonaLink takes the longer view, to a future where software agents act out human wishes; it provides a marketplace for agents or a framework for negotiation between customers and suppliers. Intelligent Communications is more about the here and now, addressing the frustrations and desires of today's mobile and online users. However, its state-of-the-art solution is designed with a clear eye to the future.

Intelligent communications

When IBM set out to design Intelligent Communications, it surveyed mobile users about their problems and wishes and assembled from these a set of objectives for the service. The studies showed that users had trouble with 'roaming' among carriers and desired a seamless network with a single point of customer support and one bill. They also disliked having to check multiple inboxes for voice mail, public and private email, and faxes. They complained of information overload and asked for new ways to filter and prioritize messages and for a means of event notification for important messages.

The key attributes of IBM's solution, says Doug Sweeney, the US-based general manager for Intelligent Communications, are personalization and integration. The service lets you tie together everything you're already using, create custom message-processing scenarios, and wrap it all in the interface of your choice. You can also receive information (for example, headlines, weather, and stock quotes) from third parties in the form of messages sent to your inbox. "We use intelligence to mask the complexity of the network, and we use agents to help you gather, prioritize, and automate handling of messages," Sweeney says.

In AT&T's PersonaLink, all devices and programs must be tooled to speak Telescript; in Intelligent Communications, they speak in their native vocabularies, and the cloud translates for them. And instead of opting for the lowest common denominator, these translations are aimed at the highest capability level supported on each platform. Thus, a rich text document might be converted to simple text for display on a pager's LCD but could appear as is on a graphical Newton.

Intelligent Communications uses a modern, message-based, interprocess communication architecture in which tasks are insulated from one another by published interfaces. As in contemporary system object frameworks, no direct 'hard-wired' interaction occurs between processes; rather, their communications with one another are passed through an arbitrating

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layer or channel. This software layering lets Intelligent Communications achieve its goal of total neutrality.

The service is neutral with respect to devices: any manufacturer's products can work with it, and all services are available to all devices within their inherent limitations (for example, a cellular phone cannot display faxes). By separating presentation from service, the IBM network permits users to continue using their current devices, environments, and applications. It is also neutral with respect to carriers, media (land line, cellular, CDPD, X.25, or ISDN; low-bandwidth or intermittent), and protocols. Carriers can maintain their own directory services or systems management capabilities without affecting the behaviour of IBM's service.

At the back end, the same kind of abstraction applies. Service and content providers can join the network with their existing offerings, which are virtualised to appear as Intelligent Communications objects or they can retool their service interfaces to accept and emit Intelligent Communications objects. As long as the service provider is willing to bind to an enabling library or to support emerging standards such as OLE or OpenDoc, users can tap into their services without starting from scratch.

Intelligent Communications will run over a variety of media, including Ardis packet radio, the joint IBM/Sears Advantix network, and (unannounced) third-party phone and packet networks. It will offer gateways to Prodigy, the Internet, and most other public and private email systems. The core hardware servers are IBM RS/6000s running AIX (just like the Internet backbone that IBM cooperates under contract to the US government), and the basic internal network protocol is TCP/IP. Intelligent Communications uses X.500 directory services internally but will, in principle, be able to make use of external directories (that is, in enterprise or carrier systems) as well as to publish its own directories to these external systems. The service will accommodate two kinds of network traffic in its first release: analogue voice and asynchronous data.

Foxy proxies

The key to making Intelligent Communications work is its use of proxies, or agents, that stand in for subscribers, devices, mailboxes, and services (see the figure 'Intelligent Commun-

ications'). The network never connects subscribers directly to services, because, IBM says, this can force application-specific coupling between the front end and back end, inhibit support for transparent mobility, and limit opportunities for adding intelligence (and value) to a subscriber's use of the service. Likewise, directory inquiries never discover the actual network address of a service; instead, all such interaction is arbitrated through the cloud. As a result, users never have to know how or where to find a service, and service providers never have to understand how to interact directly with a subscriber unit.

Inside the cloud, "the currency of the network is objects", says Mac McInerney, assistant general manager of development for the service. Intelligent Communications objects are self-descriptive, containing both static data and dynamic scripts; their presentation and interface elements are highly abstracted so that the information they contain can be adapted to the context which it is being presented. Therefore, a list box on a laptop GUI could convert automatically to a telephony interface.

The subscriber proxy virtualises the characteristics and preferences of a user. Every subscriber (including services) has an entry in the distributed X.500 directory, including name, phone and fax numbers, physical address, and home location (home location is the default service node where a user attaches to the network). Mobile users can also shadow their home location in another place for faster

response times. Because the network is distributed, your subscriber proxy is available to represent you anywhere you log in.

Information about the device or devices you use to attach to the network is contained in device proxies, which are independent of the subscriber proxy. Thus, the same person can connect at one time with a PC and at another time with a telephone, and Intelligent Communications will accommodate the difference. Even endpoint's that have been tooled to directly accept and emit objects talk through 'lightweight' proxies that administer functions such as security and billing.

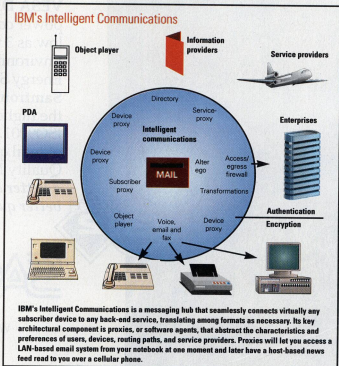
Device proxies hold information about each machine's ability to present various objects, knowing, for instance, that one system has a colour screen and keyboard while another has a monochrome screen and stylus. Devices can limit the abilities they expose at any given time, so if you wanted to receive your email in spoken form while driving, your PDA could represent itself for the time being as speech only. These proxies also understand network access methods, so delivery can be optimised to the medium being used; thus, you could automatically postpone transmission of a video clip during a wireless session until you were later connected over a suitable link.

It is in conjunction with the device proxy that IBM's remarkable format translations occur. For now, these include text-to-fax, fax-to-text (via OCR), and email and document format conversions. Down the road, IBM plans to support a speech-based

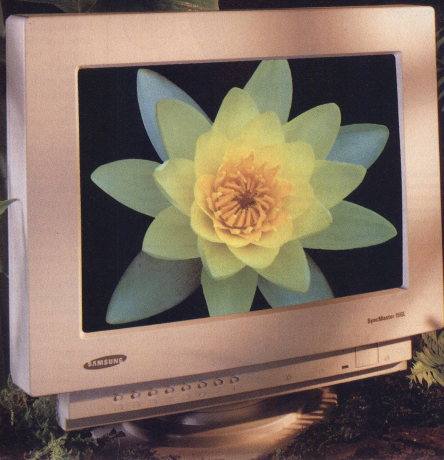
user interface and will add speech recognition, as well as text-to-speech and speech-to-text transformations.

Murray's low-priority folder

The *Alter Ego* is a programmed rules engine that represents a user's routing preferences (including how accessible the user wants to be). Over time, IBM says, this will evolve into an adaptive inference engine that learns through observation how you work and what you like. The first level of the engine does fast routing of real-time interactions, such as phone calls and paging. The second, deeper level handles non-real-time events in negotiation with other network services or *Alter Egos*; for instance, following the instructions "If I get mail from the CEO, page me; if I get any faxes from Finland, forward them to my hotel in Orlando; send all



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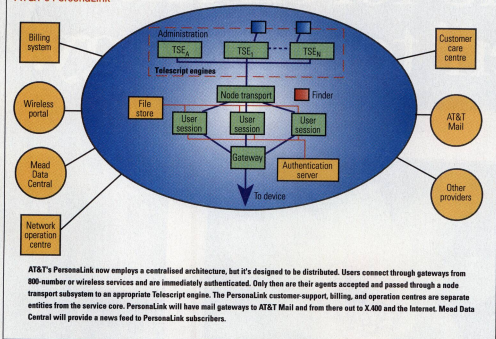
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AT&T's PersonalLink



other mail to Murray", Murray's Alter Ego might say, "If I get mail forwarded to me from anybody, put it into my low-priority folder".

The *serviceproxy* is, in some senses, the most important of all, because it is through this mechanism that IBM hopes to accommodate its huge mainframe customer base and the great majority of information databases that now use legacy systems and software. The service proxy virtualises the back end, making it appear to the network like an Intelligent Communications object. This way, you can mask a programmatic API (for example, use the proxy to issue a SQL query against a DB2 database) or even a terminal interface. The service proxy can also serve as a gateway to LANs.

Service proxies know about service addresses, network types, protocols, and billing systems, yet they hide these details from a user. Intelligent Communications-adapted services retain their native interfaces and rely on the proxy for translation to and from the object framework. Intelligent Communications-enabled services go a step further, tailoring their front ends to accept and emit Intelligent Communications objects. One advantage for the vendor in full-enabling is that it may reduce network traffic between the service platform and the network.

Intelligent Communications supports legacy services with a proxy that acts as a terminal emulator, operating a session between only itself and the host. By encapsulating the entire legacy system in an object wrapper, IBM allows traditional information providers to offer services on

the network without immediately retooling their interfaces or downsizing to servers. The service proxy also solves potential timing problems, because real-time communication occurs between only the proxy and the service, not end-to-end from the subscriber device to the host. This decoupling frees a user to access session-oriented services over less predictable wireless transports.

The real advantage of the service proxy is that it lets providers, even small outfits lacking programming expertise and resources, get onto the network easily. AT&T wants to encourage similar participation with PersonalLink, but making the leap to Telescript requires more up-front investment. After all, how many neighbourhood flower shops or pizza parlours will be able to set up and maintain an online, object-oriented merchandising server?

This link is personal

From the very beginning, AT&T has viewed PersonalLink as both a toehold into future business opportunities and a test bed for emerging network concepts. Says Gordon Bridge, president of AT&T EasyLink Services, the division that includes PersonalLink: "This was our first opportunity to develop an end-to-end solution based on connectivity — not piecemeal, not retrofit, but from scratch." What this includes, Bridge notes, is a new operating system, new devices, a new network, new customer-service programs and new billing services — in short, "every aspect of the infrastructure is green field".

AT&T took this risk in part because it wanted to explore and validate new ideas in network management and business organisation, something too dangerous and expensive to undertake on the existing phone and data networks. "It's very hard to change a service once it's up and running, so we architected PersonalLink the way it ought to be done from the beginning," says Joe Gigas, network operations manager.

For reliability, the service uses features such as redundancy, self-healing, and performance-based monitoring (that is setting targets based on actual user throughput and capacity, instead of arbitrary internal factors such as disk utilisation or error rates). And, in a break with the past, PersonalLink uses almost entirely standards-based hardware and software management (for example, SNMP and HP Open View). As a result, it requires much less human supervision than

traditional telco networks and can run on less expensive off-the-shelf equipment. Much of the internal operations management is performed via Telescript agents that query services and report results. "This is a model for future network design and management", Gigas says.

In its initial release, PersonalLink is centralised, but it's designed to be scalable and distributed. Built on RISC-based symmetric multiprocessor servers running Unix, the service operates out of four data centres (one for the core Telescript engines, and one each for network operations, customer support, and billing) connected by T1 (private, 1.544Mbps) data lines. Incoming calls to the 800-service or from Motorola's MNI are routed to a terminal server/router and from there across Ethernet to the server core. In the initial release, all third-party services, such as shopping and information, are centralised at AT&T, but in the future, third-party Telescript engines can run anywhere.

Agent foundation

Aside from its genetic use of agents, PersonalLink is different from previous services in several ways. It's designed to support multimedia message types, including voice, graphics, and annotation, and, of course, it supports intelligent routing and smart mailboxes. All addressing is done with human names, not strange numbers or codes, and it uses advanced security provisions, including automatic encryption of all communications.

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A typical PersonaLink scenario begins on a hand-held device running the Magic Cap operating system. To create a message, the user selects a recipient from a local address book or queries PersonaLink for an address and then writes the message using a local text processor. Magic Cap includes a drawer of 'rubber stamps' for messages (for example, Urgent), which appear as icons on the message as well as translate into Telescript handling instructions.

The finished message is combined with a script that tells it how and where to go, thus becoming a mobile Telescript agent. The script starts executing locally because it could include instructions for, say, accessing the local file store. But when the Telescript engine encounters a **Go** operation, it stops executing the script and readies the agent for transmission by saving all the variables, pointers, and stack values. If the place to which the agent is going is on the local machine, it is sent there; otherwise, it's wrapped up in a message, encrypted by a local RSA-like public key encryption routine, and dispatched across the WAN.

This "bag of bits", as AT&T calls it, travels to its destination over a live connection. When it arrives at the PersonaLink service node, it passes through a gateway process where it is immediately dispatched to a dedicated authentication and security server (see the figure 'AT&T PersonaLink'). PersonaLink uses two-way authentication (unusual in online services), in which both the device and the service must prove to each other that they are legitimate. Rogue devices are thus prevented from logging on and, conversely, users can't dial in to a phantom service that pretends to be PersonaLink and steals personal data, mail, or merchandise orders. The authentication server also decrypts the message.

Once past this security barrier, the agent is copied to a file store for backup, and only at this point is the connection with the sending device broken. The device can then carry on with other activities while the agent does its job at the PersonaLink service.

First, the agent goes to a node transport subsystem which looks up the recipient's mailbox address in the Finder database. It then goes to the mailbox address in the Finder database. It then goes to the mailbox (itself a stationary Telescript agent), which can decide whether or

not it wants to accept the agent. If it does, the message is unwrapped, and the script continues to execute.

Even at this point, no interaction has occurred between the mobile and stationary agents. Only when the Telescript engine encounters a **Meet** command in the mobile agent do transactions (for example, mail delivery) occur between the two. Of course interactions between agents can be used for applications beyond email. For example, a user on a device could send an agent to pick from the available seats at a concert or to pick a book from an online catalogue.

In the first release of PersonaLink, the smart mailbox will allow users to filter and route incoming messages based on sender or contents, to auto-forward messages to another mailbox or fax machine, to auto delete messages, or to be notified via pager that a message has arrived. Mead Data Central will provide a news feed (that is, headlines, stocks, sports, and weather). A shopping 'mall' from start-up company eShop, which will front other electronic merchants still to be announced, will appear shortly after the initial release date.

PersonaLink's software architecture allows for a mixture of data sources; for instance, to reduce data transmission needs, an electronic catalogue, including images, graphics primitives, templates, and parts lists, could be shipped to users on a disk or PCMCIA card. Then the only data that would be necessary to send over

the line would be new items, current prices, and spot sales. Another way Telescript preserves bandwidth is by exchanging only 'reference pointers' to objects that already exist on the target platform. For instance, most icons exist in firmware on Magic Cap devices, so if they're used in an incoming message, they can be referenced instead of being sent from the server.

In adherence with a "shoppers bill of rights", AT&T won't provide back-end vendors with information about individual users. But PersonaLink will be able to monitor behaviour such as frequent trips by a user to a given store. Then, when the user returns to a that store, the network could flag this to the vendor, who might decide to offer an on-the-spot discount or some other purchase incentive.

Teaching new tricks

The ultimate benefit of Telescript's agent architecture to users and vendors (and to AT&T) is the flexibility it affords. Contemporary online services are generally monolithic: to add a new feature requires that it be written into the core, carefully tested, and brought online without disrupting 24-hour access. PersonaLink is also aiming for 24-hour service, but its design allows agents to teach the network new tricks all the time. "We didn't have to build in all the capabilities ourselves", says Alex Gillon, director of technology development for PersonaLink Services. "This has huge implications for network design and management, because we don't have to keep turning over the network software."

PersonaLink's open design could unleash a cottage industry of agents: perhaps someone will build a better mailbox or devise an agent to find Rolling Stones tickets. But the service also needs to be protected from disruptive or merely badly written agents; hence the major emphasis on security provisions (see the side box 'Telescript security').

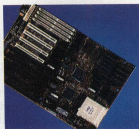
AT&T's PersonaLink and IBM's Intelligent Communications share their use of agents, their openness, and their enormous ambitiousness. IBM is looking for a way to keep its bread-and-butter large accounts in the fold, and Intelligent Communications will offer these customers a way to enable legacy applications with mobile access. Rather than see

Telescript security

Among the biggest concerns about Telescript is that an agent isn't much different from a virus. General Magic and AT&T have addressed this problem in numerous ways. The first is that Telescript is an interpreted language. A virus is typically executable code that inserts itself into a target machine; requiring agents to be interpreted at a destination precludes executing something unrecognised or illegal.

As described above, Telescript agents are encrypted and have to pass an authentication barrier. Once past it, they must have a valid address to go to (for additional security, users can layer end-to-end encryption on top of that built into the network). A place can also refuse to accept an agent if it's asking for something the place doesn't want to provide.

Telescript supports a scheme, known as permissions, to regulate the activities and life span of agents. It includes limits such as how long an agent can live, how many CPU cycles it can consume, and whether or not it can spawn children or clone itself. Permissions are negotiated among the agent, place, and PersonaLink network itself: the agent asks for a set of permits, and the place and the network publish the sets they are willing to grant. The minimum coincidence of the three becomes the set of allowed permits. Thus, a mailbox could grant an agent from its owner the right to view its contents and delete messages but would refuse those rights to an agent representing somebody else.



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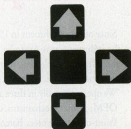


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customers drift away to distributed computing solutions from other vendors, IBM is providing the much-needed glue to pull together public and private email, text, image, voice, and paging under a single umbrella — even if some or all of these services run on non-IBM platforms. While it's refreshingly ecumenical, Intelligent Communications is deeply based on a familiar IBM concept: Some people will pay good money to have you take responsibility out of their hands and provide a bulletproof solution.

AT&T's strategy is different: the company doesn't have a large base of business computing users to protect, but it does dominate the market for voice and data telephony among companies and consumers. PersonalLink is a framework for the future of wide-area telecommunications, whether it's for the purpose of calling your grandmother, negotiating a business deal, or buying a wool sweater. It has the potential of becoming the supermall of the information highway, the online service for the 180-million Americans not now online, but it could also form the basis for business-to-business electronic commerce.

As with several projects in the telco

giant's past, however, PersonalLink betrays an AT&T-centric worldview. The service is all new, requiring users and third-party vendors to start from scratch with new devices, new software, a new interface, and a new service subscription. In effect, AT&T is saying, "If everybody would just convert to our standard, we could all communicate". On the other hand, IBM is saying, "Come one, come all; we'll translate among your formats — and we'll charge you for the privilege".

AT&T argues that having once made the investment to leap into Telescript, users and vendors will discover richer online services and new ways on conducting business. Given that Telescript is not proprietary technology, AT&T argues that it will succeed because it is the first to market and will be the best at running a network.

Perhaps AT&T's biggest potential stumbling block is this conceptual contradiction: PersonalLink is aimed at consumers and individuals and, for now, is accessed only from the cartoon-like Magic Cap interface. Yet the access devices are hardly priced at consumer levels. Resolving this conflict will have to be a priority for AT&T if it is going to attract a large enough base

of users and a community of information and merchandise vendors.

IBM's dilemma will be that in trying to please everybody, it may be biting off more than it can chew. Its Intelligent Communications service is already running a little late and isn't expected to be fully up and running until late in 1995. Meanwhile, other services will continue to add gateways and format converters. If you add to these a universal mailbox and mail filter on your client, you can get much of what Intelligent Communications aims to provide but without ongoing charge.

Agents aren't just a neat technical breakthrough that simplify mobile access and enable new types of back-end services. To an increasing degree, they will become an essential aspect of WAN design because they handle ever-increasing complexity. Service providers can't possibly support the surging base of users, devices, and online vendors with monolithic system architectures. Adding more and more point-to-point gateways or rewriting their service's core engine to accommodate new features is economically infeasible. So the only choice is to embrace the new world of distributed, modular, object-oriented technologies. ▲

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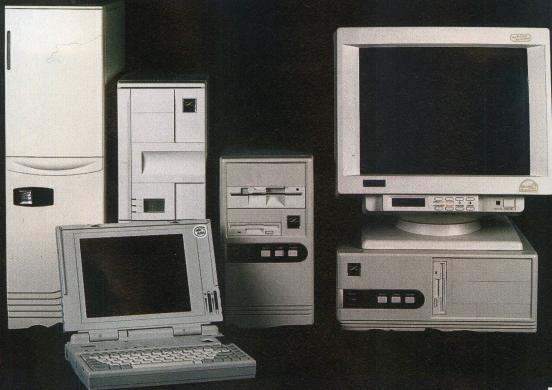
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Windows95 and beyond

In the driving seat with Windows95 Windows NT 3.5 and OS/2 Warp



They share common features, but the newest versions of Windows and NT have fundamental differences. We compare them and also take a peek at the new OS/2 Warp.

BY JON UDELL

As winter 1994 drew to a close, beta testers were evaluating the two newest members of the Windows family of operating systems: Windows 95 (aka Chicago, due in 1995) in its first beta release, and Windows NT 3.5 (aka Daytona, due now) in its last.

The two siblings have a lot in common. They can run some of the same Win32 applications. They can work with each others' files, printers, clipboards, mailboxes, and even registries. And, of course, they can both run legacy DOS and Win16 applications.

But their differences are equally profound. Chicago is a mongrel, with pre-emptive multithreading and 32-bit capability grafted onto a 16-bit DOS/Windows foundation. Daytona, the second generation of Windows NT, is a pure-bred — multithreaded and 32-bit from the ground up. To use another analogy,

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Chicago is like a car, designed for the average home or business user. Daytona, on the other hand, is like a Mack truck. It carries big loads for servers and serious business, scientific, and engineering users whose tasks justify powerful x86 or RISC workstations. Chicago, though built on a weaker foundation, can reach a large population of systems, so it gets first dibs on important advances, such as Plug and Play and MAPI 1.0. Although Daytona is built on a far stronger foundation, it finds a smaller group of machines to run on today, so it has to wait for some of the cutting-edge stuff.

Which to choose: Chicago or Daytona? It's increasingly clear that while both have important roles to play, they won't eradicate the deeply entrenched Windows 3.1 anytime soon. Four Megabyte desktop and laptop systems and 16-bit Windows applications continue to sell in huge numbers. Chicago and Daytona demand more powerful systems and applications.

The good news is that once companies start supplying users with bigger, smarter systems and Win32 applications, either Chicago or Daytona can make those users far more productive. The bad news is that during the transition period, the coexistence of Windows 3.1, Chicago, and Windows NT (not to mention other options, such as OS/2) will create headaches for software developers, systems managers, and users alike. As with all families, the windows family of operating systems can sometimes drive you crazy.

Chicago in 4M

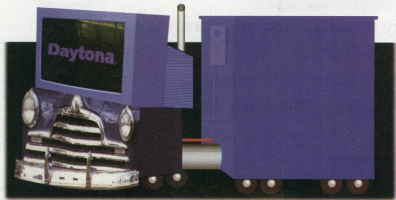
"Runs great in 4M!" that was the unofficial battle cry of the Chicago development team. The official claim, once Microsoft admitted that there actually *was* a Chicago, was more guarded and more carefully qualified. "If you're happy with Windows 3.1 in 4M," Microsoft said, "you'll be happy with Chicago in 4M." Even this, however, now seems unlikely, based on the (admittedly two-months stale) beta 1 release of the product.

I keep a low-end PC on hand, partly out of inertia and partly to test these kinds of claims. This system began life as a 4M Gateway 386/20. DoubleSpace expanded its 80M hard disk to a more livable 150M; a CPU upgrade (to a Cyrix CX486DRX2) accelerated the system nicely; and Media Vision's Memphis multimedia kit added sound, MIDI, and CD-ROM capabilities. But it's really still just a dinky PC. I won't say I'm happy with Windows 3.1's performance on this machine, but I will say that Windows 3.1 can get useful work out of it, handling easy tasks such as writing, telecommunicating, CD-ROM information retrieval, and MIDI recording/playback well enough.

Running Windows for Workgroups on this humble Gateway is another matter entirely, however. With networking turned on so that I can remotely access the office network, WFW thrashes. I've found 6M to be the practical minimum for WFW with networking; it works in 4M only without it — in effect, you're running the equivalent of Windows 3.1 beefed up with 32-bit file access. (How *can* you work remotely with a 4M Windows PC? Straight Windows 3.1, the NetWare shell, and Shiva's asynchronous IPX is one lightweight combination that has worked well for me.)

Since WFW was the dress rehearsal for Chicago's 32-bit network and file I/O subsystems, you should base size expectations for Chicago on WFW rather than on straight Windows 3.1 (although Microsoft hasn't been clear about this distinction). I didn't expect Chicago to make the 4M Gateway a useful networked machine; I expected it to make it just a useful standalone machine, as both Windows 3.1 and WFW do.

Chicago found the Gateway's S3-based Orchid Fahrenheit video board and the ProAudio Spectrum sound card with its Trantor SCSI connector, migrated the Windows 3.1 program groups and desktop settings, and rebooted. Chicago came back up with the correct wallpaper and chimed to announce that the sound system was working.



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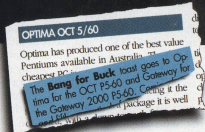
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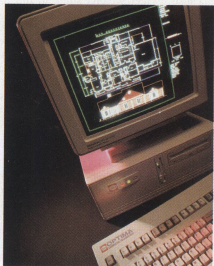
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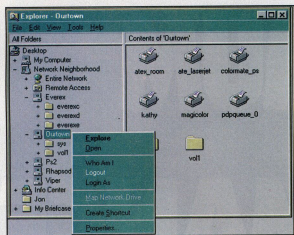
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The browsing of NetWare resources (for example, servers Ourtown and Rhapsody) using Chicago's Explorer works just like the browsing of Chicago (for example, Everest, PS/2) and Daytona (for example, Viper) resources. Right clicking on a NetWare icon gives direct access to NetWare commands, such as LOGIN and WHOAMI

Unfortunately, that's about all I could get it to do. My 4M Gateway was transformed, for all practical purposes, into a boat anchor. It can run the Chicago shell, but almost nothing else — not even the Control Panel, which I might otherwise have used to start jettisoning non-essentials, such as sound support.

How do you reconfigure Chicago when you can't run the Control Panel? The trusty old DOS start-up files still matter more than you think. Although you hope that Chicago's protected-mode drivers support your hardware, installation doesn't assume that they will. Real-mode drivers that load from CONFIG.SYS and AUTOEXEC.BAT continue to load until you see that they aren't needed. For example, on my Adaptec 1742-equipped 16M Everex Step DX2/50, Chicago left the ASPI (advanced SCSI programming interface) and Corel SCSI drivers and MSCDEX in place. When I commented them out, the system still ran perfectly fine — even better, in fact, because its feet weren't stuck in the real-mode mud.

As with DOS, pressing the F8 key at boot time makes Chicago prompt before executing each line of CONFIG.SYS and AUTOEXEC.BAT. (You can also clean-boot straight into the Chicago version of DOS by pressing Alt-F5.) Using this technique, I lightened Chicago's memory load by dumping sound and CD-ROM support. DBLSPACE.BIN had to stay because its protected-mode replacement wasn't included with beta 1, although it will be available later. DoubleSpace had to run somewhere if Chicago was going to work on this machine; shifting compression to protected mode might make the system faster but isn't likely to make it much smaller.

My tweaks helped a little, but Chicago still ran out of memory trying to run its own Control Panel applets. I will be fascinated to see whether the final Chicago product can do better. Admittedly, my DoubleSpace-equipped 4M Gateway represents a

worst-case scenario. There are, however, many such worst-case scenarios in the real world, particularly in the form of laptop PCs.

Businesses that want their road warriors to have a fighting chance should plan to outfit their troops with bigger, faster systems, and they should jump on the Plug and Play bandwagon as soon as it's feasible to do so. But the centre of gravity of the installed base moves slowly. Chicago will have to get a lot smaller and faster to run acceptably on many of the PCs that are now in use or being sold in retail stores and through mail-order catalogues.

Chicago in 8M

On a reasonable desktop machine — an Advanced Logic Research Flyer 312CT with 8M of RAM, a 486/66 CPU, and a 340M Maxtor IDE drive — the Chicago story is, as you'd expect, far more compelling. I ran the installation from WFW 3.11 and, lacking a local CD-ROM drive, used the WFW redirector to borrow a remote one. In 20 minutes, Chicago was up and running, enjoying the same access to all the WFW, NT, and NetWare resources that WFW had previously enjoyed, including redirected drives, printers, and file-based and client/server network applications.

Moreover, Chicago made things better than before in a couple of ways. One huge win is the unification of network namespaces and browsing methods across multiple network providers. (Note that NT has always had this kind of multiprovider capability; now the NetWare client included with Daytona visibly exploits it.)

Under WFW, I redirect to an NT drive like this:

```
net use h: \\EVEREX\\EVEREXCD
```

but to a NetWare drive like this:

```
map root t: \\OURTOWN\\VOL1:TEMP
```

In Chicago (or Daytona), it's all done with a consistent UNC (Universal Naming Convention) syntax, so the NetWare mapping becomes the following:

```
net use t: \\OURTOWN\\VOL1:TEMP
```

Under WFW, GUI-based drive and printer redirection works one way for Windows network resources and another way for NetWare resources. Chicago's Explorer treats both flavours of resources identically.

Although Chicago defaulted to the real-mode ODI-based (Open Data-Link Interface) NetWare client I had been using under WFW, I then used the Networks applet in the Control Panel to switch to the protected-mode NDIS-based NetWare client that comes with Chicago. It's still unfinished, but the NetWare client is fast and very functional. Although support for protected-mode ODI isn't part of the current plan, the recent Microsoft/Novell detente raises hopes that Chicago's already-strong NetWare support will get even stronger.

Both Chicago and Daytona have the ability to run essential NetBIOS and RPC-based (remote procedure call) networking services over any of three transport protocols: NetBEUI, IPX/SPX, and TCP/IP. I've used all of these protocols successfully. (The Chicago and Daytona remote-access services can both use PPP, which extends this protocol's flexibility to asynchronously connected systems, too.)

Since the Chicago and Daytona TCP/IP stacks support DHCP and WINS (Windows Internet Naming Service), administration of TCP/IP is a lot easier than before (see "Automating TCP/IP in NT" on page 150). I'm running DHCP on a Daytona Advanced Server system, which automatically allocates IP addresses to my Chicago and Daytona clients, as well as to my WFW 3.11 system running the new VxD-based (virtual device driver) TCP/IP stack.

What about WINS? It isn't a factor on our single-subnet LAN. It comes into play only during the mapping of NetBIOS names across TCP/IP subnets, as an automatic and dynamic substitute for the cumbersome and static LMHOSTS file that maps NetBIOS names to IP addresses.

Despite significant TCP/IP improvements, both Chicago and Daytona default to the NetWare standard, IPX/SPX. Why? It's routable, unlike NetBEUI, and works right out of the box, unlike TCP/IP, which minimally requires that you set up DHCP (and possibly WINS) servers and keep them running all the time. Since IPX/SPX is required to connect Windows to NetWare in most corporate LANs anyway, it makes great sense to accommodate Windows to it. Multiprotocol networking is

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IBM engages warp drive for OS/2

BY STAN MIASTKOWSKI

Experience counts. That's one of the messages that IBM is continually repeating as it gets ready to roll out the next version of OS/2. The company's experience in operating-system development isn't difficult to see with the product that has gone through one of the most extensive beta tests in the history of software development.

The product will officially be called OS/2 Warp, and will sell to current Windows or OS/2 users for \$179. OS/2 Warp with Windows will be available in December.

IBM said it would make OS/2 installation much easier through extensive built-in code for identifying the hardware on which users are installing it. The only way the company could test the hundreds of thousands of hardware combinations existing out there in the real world was to have as many users as possible test OS/2.

Although IBM declined to discuss the technical details of how Warp identifies hardware, problems with strange hardware combinations were expected, and they quickly cropped up. Three out of four PCs that I tested — starting with an ancient no-name 386/33 with a Tandy CD-ROM drive — failed to load the Warp beta version. I finally got Warp running on a genuine IBM 486/33-based PS/ValuePoint.

IBM technical support quickly released an updated installation file that solved my problems on two of the three machines that

wouldn't load Warp. By the time Warp ships, IBM expects to have solved the vast majority of installation problems.

Doing more Windows

Although IBM continues to develop additional versions of OS/2 that incorporate advanced features, such as symmetrical multiprocessing, Warp is a different animal, aimed squarely at the large universe of individual Windows users who want a more advanced operating system than DOS underlying Windows 3.x. Like OS/2 for Windows 2.1, which has been available for nearly a year, Warp integrates your existing Windows installation into the OS/2 environ-

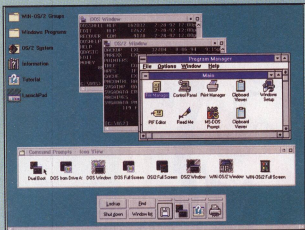
ment. If one crashes, the others keep running.

Unlike OS/2 for Windows 2.1, Warp now works with Windows 3.11 and Windows for Workgroups, and it is compatible with applications written for Microsoft's Win32s API. The person in charge of Warp development, Paul Giangarra, who was also the chief designer of OS/2 2.0, declined to explain how this was done, but he said it was "simply a job of polishing the code". Warp still doesn't work with applications that use Windows VxDs (virtual device drivers), but at the moment that's an extremely small part of the universe of Windows applications.

As a full-fledged 32-bit operating system, OS/2 has developed a reputation for requiring powerful processors and lots of memory. This is true enough, but in this release IBM has made an effort to produce a product that will run adequately on older processors and systems with 4M of RAM.

Giangarra is philosophical about this, saying the 4M requirement is "what the market wants but not what the industry buys". He also points out that many major Windows applications require 8M of RAM. Although I wasn't able to test Warp on a 4M system, its performance on an 8M PC is noticeably faster than that of its predecessor.

Giangarra adds that there's no big mystery to making Warp smaller and faster. "In first releases, you do your best. Later, you go back and shine things up," he says. IBM developed automated tools for testing and optimising Warp code. "We produced gigabytes of traces



The WorkPlace Shell for Warp looks similar to that for the prior version. However, in addition to the 3D icons and LaunchPad (at the bottom of the screen), behind the shell are increased performance and additional Windows compatibility.

ment. This integration allows you to use Windows and its applications in the familiar manner, but with the advantage of using OS/2's preemptive multitasking and linear memory space to 'wall off' applications from

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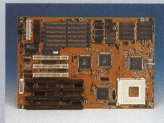


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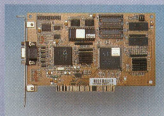
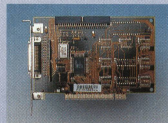
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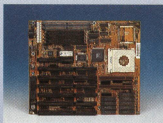
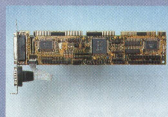
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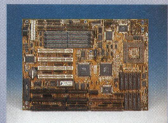
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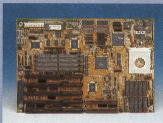
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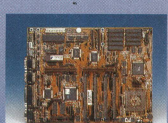
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and found the places where code wasn't efficient," says Giangarra. As a prime example, IBM completely rearranged the all-important code-paging algorithms, under the direction of the person who developed the MVS (IBM's mainframe operating system) pager.

On a screen near you

At first glance, the Warp desktop looks nearly identical to that of OS/2 Windows, but a closer exploration reveals some interesting changes and additions to its look and feel. Besides the 3D icons (which are nice, but far from essential), IBM has done a great deal of work at making the object oriented Workplace Shell easier to use. It still requires something of a paradigm shift to use, especially for experienced Windows users. But the more you use it, the more sense it makes.

New and useful are status-sensitive folders icons that appear opened when a folder is opened, and closed when it's closed. You can also choose to close parent folders when you open applications of folders. This makes for a desktop that's much less cluttered. And there's also a pick-up-and-drop option for moving icons, which is essentially a clipboard for icons. Finally, there's the LaunchPad, which is a handy, floating, customisable toolbar that enables you to set up your favourite folders and applications for single-click access.

Dialog boxes and settings screens hidden behind the Workplace Shell also make a lot of sense. Involved dialog boxes are split into easily accessible categories, and IBM has eliminated some of the confusing technospeak; for example, you no longer "migrate" applications to OS/2; you "install" them.

IBM has also made an effort to make life easier for portable computer users. PlayAtWill is a new utility that IBM claims offers full plug-and-play (though not based on the Microsoft/Intel Plug and Play stand-

ard) capabilities for PCMCIA card users. Although I wasn't able to test it, IBM claims that you can associate applications with specific PCMCIA cards. For example, plugging in a fax modem card would automatically launch communications software.

Real applications

Largely, IBM has tossed the wimpy and largely useless mini-applications that were shipped with previous versions of OS/2. They've been replaced by the BonusPak, which includes IBM Works (a miniature suite of 32-bit native OS/2 applications), Fax-Works for OS/2, CompuServe Information Manager for OS/2, Personal Information Manager, Person-to-Person (a simple workgroup-collaboration tool), and advanced system configuration/testing utility.

At the bottom line, it's obvious that IBM has put a great deal of time and effort into making Warp a highly optimised, easy-to-install, and easy-to-use operating system that offers next-generation power to existing users without requiring them to invest in additional hardware.

With the delay of Windows 4.0, IBM has been handed another chance to take over a chunk of the desktop market. And, interestingly, the dearth of true 32-bit native OS/2 applications seems to have become a minor inconvenience instead of a major shortcoming, especially because of how well OS/2 integrates with existing Windows installations and applications.

Experience counts, and Warp bears all the hallmarks of an experienced operating system. But, at the bottom line, Warp's success will depend on IBM's making it widely available in the marketplace, especially through having it preinstalled on new hardware. Purchasing prior versions of OS/2, for example, required a determined effort. For Warp to be a success, that has to change.

Stan Miskowski

neat, but not just for its own sake. Microsoft's agnostic approach to network transports is a laudable achievement.

Two important new features, user-level security key to Windows NT Server and NetWare servers and a so-called master key authentication service, weren't quite cooked in beta 1. When you share a Chicago resource, you'll be able to specify share-level security, which challenges all users to unlock it with a password you assign to the resource, or user-level security, which admits only those users you select from lists authenticated by NTAS or NetWare. The latter is a great way to control the anarchy of peer networking, and I wanted to see it in action, but beta 1 Chicago couldn't find NetWare binderies and hung trying to access an NT user database.

Chicago's master key is another bright idea, intended to enable you to unlock a set of password-protected network, mail, and other services with a single password. In beta 1, a single password did work for both network providers and mail, but the Networks-Security-Set Passwords dialog box, where you'll administer the master key, didn't reflect that.

Managing devices

Users' experiences with Chicago will vary widely depending on the hardware they put it on. There's a vast difference, for example, between Chicago on a conventional system and Chicago on a Plug and Play system. Chicago can also behave very differently from one conventional system to another.

Consider the thorny problem of ISA/EISA hardware detection. Chicago tries hard, and you can read in DET-LOG.TXT the record of its heroic struggle to identify motherboard, video, SCSI, network, and other devices by sniffing and poking. Results vary. When I tried it on four different machines, detection always succeeded with video, usually with SCSI,

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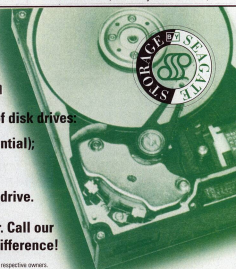
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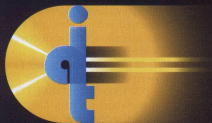
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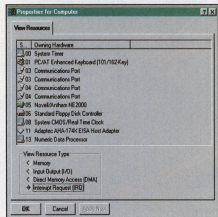
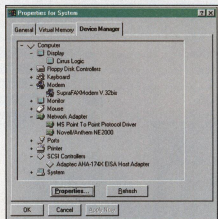
Of course, knowing that a Future Domain 1660 or an NE2000 is present isn't the same as knowing how that card is set. In my tests, Chicago almost always punted and took the defaults, even though my hardware often wasn't set that way. So I had to use the new Device Manager to configure boards, and in the end, detection was mostly a waste of time.

On one system, the Everex Step DX2/50, it was a disaster. Trolling for SCSI cards, Chicago kept poking I/O address 300 (used by the NE2000), hanging the system each time. Setup is restartable, but this routine gets old in a hurry: "BusLogic, are you there at 300?" Wham! "UltraStor, are you there at 300?" Wham!

Intriguingly, Daytona sailed through hardware detection on the very same Everex machine. Microsoft says that Chicago and NT share detection code and data, but it sure doesn't look that way. I've found Daytona's detection to be less ambitious than Chicago's, but more reliable. If you plan to deploy both operating systems on the same hardware, be certain to study the hardware compatibility lists carefully.

Don't assume that a Chicago machine is by definition an NT machine or vice versa. For example, I've got Daytona happily humming along on a Compaq ProLiant, giving both 66MHz Pentium CPUs a workout. When I installed Chicago on the ProLiant, its protected-mode disk driver threw an exception and suggested that I try a real-mode substitute. In real life, you'd never waste a classy multi-processor system like the ProLiant on Chicago. But while Chicago and NT may someday share a common pool of Win32 applications, they're further apart, in terms of device support, than Microsoft originally led us to believe.

Does Chicago's device management add any value to today's non-Plug and Play PC? Yes. Like Daytona, Chicago keeps all configuration data in the registry. Once you help it figure out what the configuration is, you can review it using the Device Manager or RegEdit (see the screen shot on page ^^^). And, as with Daytona, Chicago's RegEdit is RPC-enabled, so system managers can review and edit configurations on remote PCs. Furthermore, Chicago will export configuration data to



Once automatically detected or manually configured, Chicago's Device Manager summarises installed services (a) and their settings (b). The registration database is the configuration viewer/editor of last resort

system management consoles by way of DMI and SNMP agents.

Given the state of conventional hardware, your Chicago experience also depends a lot on whether your device support comes from DOS, Windows 3.x, or Chicago itself. I've tried it all different ways. Working with an unsupported SCSI controller and CD-ROM drive, it was nice to be able to fall back on DOS, but it was depressing to have to fiddle with CONFIG.SYS, AUTOEXEC.BAT, MSCDEX, SmartDrive, and more.

Working with a Future Domain 1660 cabled to a Plexor CD-ROM drive, however, life was wonderful. Using the Win32 version of Martin Heller's Image3 GIFviewer, images leaped from a CD to the screen, following a 32-bit path through the

SCSI driver, the disk cache, and the CD-ROM file system. All I had to do was configure the Future Domain card in Device Manager. Chicago (like Daytona) just takes care of details that DOS and Windows expect the user to handle.

Chicago won't be the only PC operating system to support Plug and Play; OS/2, PC versions of Unix, and (I hope) NetWare will, too. But with its Plug and Play ready drivers, setup and configuration tools, and shell, Chicago currently leads the pack in readiness.

Meet the Chicago Shell

As promised, Chicago can log in to and log out from NetWare on the fly, correcting a windows flaw that has caused endless wailing and gnashing of teeth in the corporate world. The method of access to these functions nicely demonstrates one of the principles that Chicago borrows from IBM's Workplace Shell: you right-click on shell objects to expose their properties and methods. In the case of an object that represents a NetWare server, a right-click pops up a menu from which you can directly invoke NetWare commands, such as LOGIN, LOGOUT, and WHOAMI. Right-clicking on objects that represent files reveals properties such as size and modification date, and methods such as quickview, which invokes a viewer to show the contents of the file.

Workplace Shell users will find the Chicago shell eerily familiar. Both shells make extensive use of right-click-activated property editing and method activation, tabbed property editing and method activation, tabbed property pages, aliases (called *shadows* in OS/2, *shortcuts* in Chicago), and fully nestable folders. Both also exhibit the same fundamental design flaw: namely, failure to unify the file system with the desktop object system. In other words, the file system depends on one root (C:\), while the desktop object system depends on another (C:\DESKTOP for OS/2, or C:\WINDOWS\DESKTOP for Chicago).

What's wrong with this arrangement? It overloads the notion of a top-level folder. For example, the first thing I did with the Chicago shell was to create a top-level folder called Jon and drag some files into it. Later, browsing with the Explorer, I opened what I thought was a top-level folder called Jon and discovered those files were missing.

Where had they gone? From the shell's perspective, the top-level Jon folder was C:\WINDOWS\DESKTOP\JON, and that's where it put my files. While browsing with the Explorer, I expected to find a top-level Jon folder at the root of the C drive, which I did: C:\JON. Which is the



Don't assume that a Chicago machine is by definition an NT machine or vice versa.



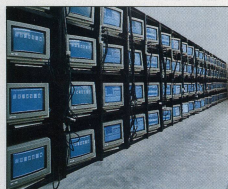
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real top level? Either, really, depending on how you think about it. As Apple's user-interface guru Donald Norman could have told both IBM and Microsoft, this kind of conceptual overloading is a dangerous thing.

It gets worse. In some situations (for example, the File Open dialog box), Chicago hides the desktop's root, C:\WINDOWS\DESKTOP, while in other situations (such as the DOS C: prompt) it doesn't. This inconsistency yields weird results. For example, I put some Visual C++ project subdirectories into the file system's top-level Jon folder, and others into the desktop's top-level Jon folder. All projects were accessible from Explorer, but only the C:\JON folder was accessible from the Visual C++ File Open dialog box. However, from a DOS window I was able to change directories to C:\WINDOWS\DESKTOP\JON and then load Visual C++ projects stored there by typing **start project.mak**.

True Chicago applications are supposed to call a version of File Open that respects the desktop's notion of hierarchy, not the file system's, and so will behave differently than legacy Win16 applications in this respect. Confused? I sure was.

I can hardly imagine what novice users will make of all this. On a Mac, there's no disconnection between physical and logical storage. Users know that the desktop is a view of the hard disk and that the window system and the file system are synonymous. In Windows 3.x, the File Manager/Program Manager split presents physical and logical views of storage, but Program Manager's logical view is not too ambitious and doesn't invite confusion with File Manager's overtly physical view. In OS/2, Workplace Shell, and the current Chicago shell, the logical view is very ambitious and always at war with the physical view.

A logical view of storage can be very powerful. The question is how to implement it. I think Microsoft has the right idea: Insert a high-level API between programs and their data. OLE 2.x structured storage is such an API. In Daytona's successor, Cairo, OLE-structured storage will be able to attach to, and extend, the file system. As the Explorer navigates from a file store into an object store, control will be transferred from Explorer's viewer to an object-supplied viewer. Object internals won't be stored in user-visible directory structures, so users won't trip over them.

The OLE 2.x strategy is an ingenious bridge between today's world of file-based storage and tomorrow's world of object storage. Microsoft hopes that users lured by compound documents and in situ editing will voluntarily commit more and more data to object storage. As that shift occurs, Windows will be able to sustain more comprehensive and more seamless logical views of storage.

The InfoCenter

One excellent example of how this can work is the Chicago InfoCenter, which appears as a top-level desktop folder when you install MAPI 1.0 and the Chicago mail system. There is a directory called C:\WINDOWS\DESKTOP\INFOCENT, which corresponds to be the InfoCenter. But it's virtually empty. All you'll find is the OLE 2.x interface ID that the shell uses to invoke Chicago's mail client. It, in turn, creates a logical view of the InfoCenter as a structure of nested folders containing objects (that is, messages) that, when right-clicked, invoke methods that are used to edit, address, send, forward, or delete messages.

This brilliant idea deserves some careful study. How can developers implement it? The mechanism is still being invented and is, like everything on the cutting edge of OLE, fairly obscure. It's not nearly as accessible as the straightforward SOM (System Object Model) hierarchy that underlies the Workplace shell. If Microsoft follows true to form, however, a future

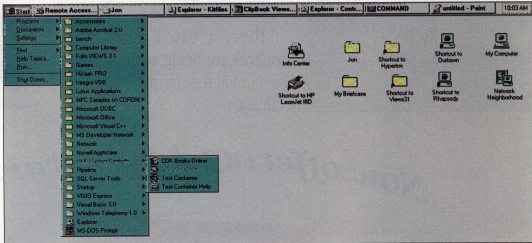
address book. Getting things to work took some persistence because the CompuServe provider wouldn't talk to my modem at first. After much poring over its script files, I found the problem. Chicago's RAS (Remote Access Service) was listening on the same COM port that the CompuServe driver needed.

Contention for that port wasn't a problem for HyperTrm, Chicago's telecommunications tool, because HyperTrm and RAS both comply with the TAPI (Telephony API) rules for shared access. Once I shut down RAS, things worked fine. CompuServe and Microsoft Mail messages mingled happily in my inbox, and I could send a single message to users on both systems with one mouse-click.

Easier Windows?

When Microsoft user-interface researchers polled a group of Windows 3.1 users, they found that most ran one program at a time. How, then, to expose Chicago's more formidable multitasking to novice users? The shell team's answer is the Taskbar, which combines the functions of an application launcher with those of a task switcher.

Always visible unless you explicitly hide it and dockable to any edge of the screen, the Taskbar's cascading launcher puts programs and recently used documents within easy reach. Once launched, applications minimise to the Taskbar, which in turn provides a constant visual summary of what's running on the system and reac-



tives minimised programs with a single mouse-click. The most visible emblem of Chicago, the Taskbar serves its purpose and may help sell multitasking to the masses, but I miss the old Task Manager's handy list of running applications.

Microsoft also touts the ease-or-use benefits of Chicago's help system. Specifically, the new help system is supposed to take you to the scene of the action it

activates minimised programs with a single mouse-click. The most visible emblem of Chicago, the Taskbar serves its purpose and may help sell multitasking to the masses, but I miss the old Task Manager's handy list of running applications.

Microsoft also touts the ease-or-use benefits of Chicago's help system. Specifically, the new help system is supposed to take you to the scene of the action it

describes. When you're trying to set up remote access, for example, the help topic should provide a link to the RAS configuration dialog box. That's a good idea, but not nearly the brilliant innovation that appeared in Apple's System 7.5. Because the System 7.5 Finder is Apple Event-aware, the new Mac help system can not only take the user to the scene, it can also enact the whole drama, driving the shell under script control and coaching the user along the way.

The Windows way to achieve this effect would be to OLE-automate all aspects of shell operation. Chicago will not work that way, but it should. Desktop operating systems are complicated, and no matter how you organise their knobs and levers — in dialog boxes, menus, or tabbed notebooks — there's a ton of procedural lore for users to absorb. For example, when I am configuring RAS, do I take the path Network Neighbourhood-Remote Access-Connections-Dial-in Options or the path Control Panel-Network-Configuration? And which settings on which property pages found in these places do I tweak to get the results I want? Making the system the coach would be a great use of OLE 2.x automation.

Users on the move

Chicago's so-called mobile services include single-port dial-in and dial-out remote access and a special desktop folder, called the Briefcase, that synchronises sets of files across Chicago systems. For multipoint service, you need Windows NT Server 3.5, which quadruples to 264 the dial-in capacity of NT 3.1 Advanced Server.

Eventually I got both Chicago and Daytona to work as both RAS clients and servers, but fiddling with communications settings was a tedious chore. If Chicago, in particular, is going to be something that you can just hand over to a busy field-sales force, it ought to get smarter about this sort of thing. Once I was connected to the office from a Chicago PC at home, though, the view was breathtaking. For the first time as an asynchronously connected user, I could see both Windows and NetWare resources simultaneously.

In fact, there are two ways to achieve this effect. You can run multiple network clients on the remote PC, or you can run only the Windows network client and use Windows NT Server 3.5 on the office LAN as a gateway that republishes NetWare resources for local or remote Windows network clients.

A problem with WFW's RAS was that it tended to hog the system when communicating. Chicago's threading alleviates this problem in some cases. A file search, for example, ran nicely on a background thread. But browsing with Explorer was

painfully slow in beta 1, and it monopolised the system. Click on the wrong remote folder, and you can be in for a long wait as Explorer fetches dozens — or even hundreds — of filenames. Microsoft, which has been urging Chicago developers to write network applications that work intelligently on slow links, should heed its own advice and make remote browsing incremental and more interactive.

The Briefcase is intended to help you synchronise Chicago systems, using either RAS or floppies to transfer data. With RAS, you can synchronise a Briefcase that lives on your home system with a set of files back at the office, updating from office to

home at the start of an evening work session, and vice versa at the end of the session. That's less useful than it sounds, though, because it requires two phone calls. I find it easier and quicker to simply drop a floppy disk into my real briefcase.

Here, though, Chicago's Briefcase metaphor failed me. I thought I could just drag it from home PC to floppy, and then from floppy to office PC. But Briefcases synchronise with sets of files, not with other Briefcases. The second step of the floppy shuffle triggered a sharing violation: You can't smash one system's Briefcase on top of the Briefcase belonging to another PC and expect them to somehow merge.

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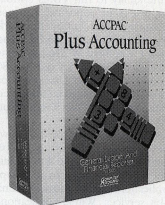
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From Chicago to Daytona

Even in its current rough state, Chicago can do a lot of useful work. On my 16M Everex, I already prefer it to WFW 3.11. Daytona, however, now much slimmer than NT 3.1, is making a bid for dominance on this machine. The trade-offs are vexing. Chicago is snappier, especially when running demanding Win16 applications. For example, I've been building a lot of Folio Views infobases lately on this machine, and while I'd prefer to use Daytona, Chicago gets the job done quicker.

Chicago is also cleverer in some ways. For example, its new printing subsystem, which spools to an enhanced metafile that renders on a background thread, really does speed up return-to-application time. But Chicago isn't yet immune to those annoying 'The system has become unstable' messages, and, given its heritage, it likely never will be. Daytona, on the other hand, has the stability I cherish. Its sophisticated performance-monitoring and event-logging services also make it inherently far more manageable than Chicago.

Other Daytona improvements include OLE 2.0 support, Chicago-compatible long filenames on FAT (file allocation table) file systems, the ability to run VDMs (virtual DOS machines) in separate address spaces, smaller and faster network transports, and OpenGL 3D graphics. The beta version I tested ran Win16 programs somewhat faster than NT 3.1 did on x86 hardware, and dramatically faster on Mips and Alpha systems, thanks to an improved Insignia emulator and WOW (Windows on Windows) subsystem.

Because Windows 3.x is the cash cow, these extensions get built first in 16-bit form. Then they migrate to the Win32 platform, but not necessarily in lockstep. Win16 applications on Chicago or Daytona need 16-bit services, Win32 applications need 32-bit services, and 16 and 32-bit flavours must be made to interoperate.

If you're thinking about a staged upgrade from Windows 3.x to Chicago, Daytona, or both, you will need to verify that the components you need are available and will work in the combinations you require. Is there light at the end of this tunnel? Not, I think, until Win32 becomes the preferred platform for new Windows extensions.

Daytona's multi-VDM Win16 capability works well, protecting Win16 applications from one another. Microsoft says that Daytona would ensure reliable DDE and OLE traffic across VDM boundaries, and my tests bear out that claim. This feat is easier for NT than for OS/2 because NT can use its Win32 DDE and OLE engines to route the traffic, while OS/2 has to use its own special-purpose router.

The advent of OpenGL graphics bolsters NT's claim on the scientific workstation market. The OpenGL SDK (Software Development Kit) demonstrations and the way-cool new 3D Pipes screen saver appear very much at home running on an SGI/Mips R4400-based Magnum. Microsoft says the Daytona implementation can exploit accelerated OpenGL hardware.

Daytona does not, however, deeply integrate OpenGL with Win32. OpenGL is a separate library that owns regions of the screen bounded by Win32 frames. Win32's imaging model, which works in only two dimensions, could make excellent use of third, but for now, Win32 applications and OpenGL applications inhabit different worlds.

The Win32 horizon

The first beta version of Excel for NT has just arrived, for x86 and Alpha CPUs. It's a Win32 application, so it should run on Chicago, right? Well, someday it probably will, but not yet. Excel for Chicago (if it exists yet) would also be a Win32 application, so it should run on NT, right? Well maybe not, if it binds tightly to Chicago

shell services that are not available on Daytona.

At the moment, it's sometimes hard to predict what won't run where, or to explain why. Of course, the Microsoft Visual C++ 2.0 beta version that's now circulating can generate x86 Win32 binaries for both Chicago and Daytona, and its version of MFC can even render some user-interface details in a context-sensitive manner. So, there's hope from that quarter for source-compatible, if not binary-compatible, Chicago and Daytona applications.

Some Win32 applications that are available today do run on Chicago or Daytona — MicroEdge's Visual SlickEdit, for example. Even if such applications show up in significant numbers, there will still be a performance gap between Chicago and NT. A lightweight operating system will always get more out of a given seat of hardware than an industrial-strength one. So, on uniprocessor x86 hardware, if you want flat-out speed above all else, run a Win32 application on Chicago — not NT — if you can. Given multiprocessor or RISC hardware, though, only NT can take that Win32 application to full throttle.

I favour security, reliability, and manageability over raw speed, as long as the performance is adequate. Daytona's performance will be good enough for more desktops than NT 3.1's performance was; however, for Win16 applications, it still likely won't match Windows 3.x, Chicago, or the latest version of OS/2 (see the text box 'IBM engages warp drive for OS/2' on page 140). For Win32 applications as well, Daytona probably won't out-run Chicago. On smaller systems, NT isn't even an option.

The upshot is that we'll be living with the whole Windows clan for the foreseeable future. CONFIG.SYS and SYSTEM.INI wizards can now branch out into new realms of registration-database esoterica. I guess this is progress, but could somebody please pass me the ibuprofen?

Jon Udell



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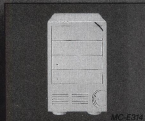
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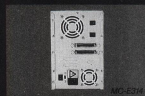
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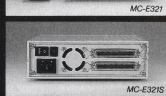
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Automating TCP/IP in NT

BY PETER WAYNER

Laptop computers make it simple to carry almost all of your desktop environment with you. Everything except your network connectivity, that is. If you carry a laptop to a meeting or another office and then plug it in here, you may or may not get what you wanted because the file servers and other connections might not be available on that subnet. More importantly, mail and other messages might not be able to find you because your computer is now in a different branch of the network. This problem is growing larger as more people turn to standards like the IP (Internet Protocol), which can handle large networks but requires continual upkeep to adapt to new configurations.

Microsoft recently announced plans for creating a new set of protocols that would add much of the flexibility of small office LANs to the IP so that companies can grow and evolve their networks quickly and easily. Microsoft will offer two open standards to the Internet community. One, DHCP (Dynamic Host Configuration Protocol), lets computers set up their network addresses on their own without stepping on toes. The other WINS (Windows-Internet Naming Service), allows computers to publish their names to the world. The combination of these two protocols will allow ordinary machines to automatically establish themselves as clients on an Internet-capable network with much the same ease that they do in systems like AppleTalk.

This approach is necessary because Microsoft decided to adopt the IP when it became apparent that this standard would dominate the worldwide Infobahn. The standard is robust and flexible in part because it was designed by DoD (Department of Defence) researchers seeking to find a way to create a fault-tolerant network to link US armed forces in the midst of battle. For this reason, the network can route packets between nodes even when the links are dropping in and out of service.

This high-speed flexibility is only possible when machines keep the same network addresses and stay in the same location. If you pick up your laptop and walk to another building with a different local network environment, the network administrator must reconfigure the network so that your packets can follow you. This may take only a few keystrokes, but even these finger taps can be prohibitive if hundreds of users are always reconfiguring the network administrator when they get up and move.

Many low-end LANs have this flexibility as a side-effect of their simple design that links all computers with one shared pair of wires. This means that a packet sent from one machine to another will reach all machines in the network. If you move your machine to a different connection, then it will still receive all the messages and pick out the ones intended for it. But this approach quickly breaks down as

more users crowd the cable. Once a router is installed to break up the network, techniques like the DHCP and WINS become necessary.

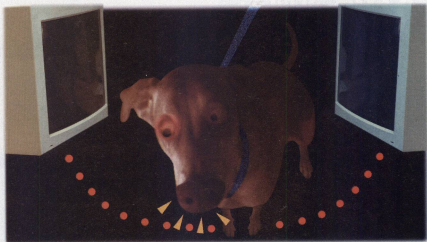
DHCP

The first new layer in the system is the DHCP, which runs on a router or centralised machine. This DHCP server maintains a collection of addresses and assigns them to users. When a new machine signs on, DHCP gives it an available address if it has one.

A DHCP server maintains order on the network by enforcing a time limit on the addresses. When a computer requests an IP address, it doesn't get to own that address; it only receives a 'lease' with a set expiration date. When the lease is half over, the computer is responsible for renegotiating its lease with the DHCP server. In almost all cases, the lease will be renewed. The protocol is designed so that a laptop's lease on an IP address will simply expire if that laptop isn't around to ask for it again. Then it can be reassigned later.

The lengths of the leases are automatically determined by the DHCP server using parameters established by the network administrator. If a network supports plenty of laptop computers that are disconnected and reconnected frequently, then the administrator will choose a short lease that only lasts several hours. This ensures that unused IP addresses will be freed up as soon as possible. But if a network includes many stable desktop machines that rarely migrate, then the administrator will probably allow leases that last several months.

The administrator will also choose a lease length by examining the number of users and the number of available IP addresses. If the network is crowded, then the ad-



Microsoft gives Windows NT greater capability to assign network addresses.

ministrator needs to choose a shorter expiration time to keep the few extra addresses available. Less saturated subnets that might have 30 to 40 machines and 254 available IP addresses can extend much longer leases. Ambitious administrators might want to study queuing theory, which will give them a basic estimate of the right length of time for the leases.

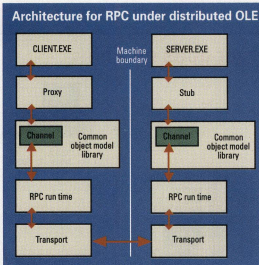
Failure mode

Microsoft is also recommending that the minimum length of a lease be set to be twice the maximum amount of time that a DHCP server might be down. So if the network staff always takes the full weekend off, then you should choose a minimum lease length of four days. In the worst possible case, a server will crash at the beginning of the weekend just before a machine starts to ask for a renewal. If you've set the leases to be twice the maximum expected downtime, then the machine will still have two days to go before the lease expires.

If a DHCP server is still down after 87.5 per cent of the length of a lease, a client goes into a 'panic' mode and searches everywhere for a new IP address. If there is another DHCP server available, then it will offer a new IP address and the computer will switch over. This can be disastrous if it happens while your machine is expecting data at the old address. An FTP connection, for instance, would be broken. But it won't make a difference if you're not using the network at that moment.

Microsoft suggests leaving two DHCP servers on a network so that one can solve problems if the other is down. The DHCP software was designed to live with any of the ambiguities caused by having two or more servers trying to supervise a network. For instance, the client gets to choose addresses if several servers respond to a request for an IP address.

There are limitations to the software. At this time, there is no way for two DHCP servers to coordinate their use of a shared address space. That means if there are 200 available IP addresses for a network governed by two DHCP servers, then the administrator must split them up between the two. If one machine fails, then the other will only be able to dispense leases for the IP addresses that it holds. The lack of coordinating mechanisms



The diagram gives an overview of the system architecture of the RPC portion of Distributed OLE. Note that CLIENT.EXE talks only to the proxy; it is unaware that the server functions are being handled remotely by another machine. All components other than the client and server executables are based on OSF's DCE RPC.

prevents it from completely assuming the duties of the other. Microsoft says it is developing a future version of DHCP that will allow communication between the DHCP servers.

Deep structure

The structure of the DHCP request is built to be 'nearly identical' to the BOOTP format used by companies like Sun Microsystems to allow machines to start up from a remote disk. Keeping the same basic format makes it easier for software authors to upgrade their software. BOOTP routers will correctly route DHCP addresses with little modification. Several of the reserved bits were converted into flags and also several fields were used for different purposes.

The flags were created out of 16 unused bytes in the BOOTP message format. One bit specifies whether a new computer is able to receive messages before the address is formally allocated. Some of the additional fields allow a machine to request a particular IP address if it is available. Another contains the address of any gateway that is relaying the packet into another subnet.

The main difference is built into the intelligence of the servers. The BOOTP server needs to be programmed with the network address codes of all machines asking for IP addresses. The DHCP server adapts itself to requests.

Other solutions

The DHCP approach seems simple, but it is still an improvement over previous attempts. For instance, the MacTCP extensions to the Macintosh system can dynamically set its own IP address when the Macintosh starts up. But many network administrators have found that MacTCP's approach often yields problems in networks with several different types of machines.

The MacTCP software randomly chooses an IP address from a small predetermined set and then broadcasts a message asking if there is anyone out there with this address. This approach works fine if the network is only used by other MacTCP users who leave their machines turned on to this random setting. Many users quickly dis-

covered problems when their Macintoshes shared the network with workstations or other machines that thought they had a fixed address carved in stone. A freshly turned on Macintosh would often steal the address of one of these systems when it was off. When both were on, they would start using the same address and get their data mixed. This problem occurred frequently in places where users turned off their machines at night.

This weakness arises because the MacTCP is not relying on a central server. This may be an advantage if a company does not want to invest the extra money and resources, but it also causes its share of problems. Imagine you wanted to fix one particular address to one machine. If you wanted to do it with the decentralised MacTCP, you would need to go from machine to machine to remove this address from its list of available choices. A centralised DHCP server is the only stop necessary in a server-based system.

WINS of change

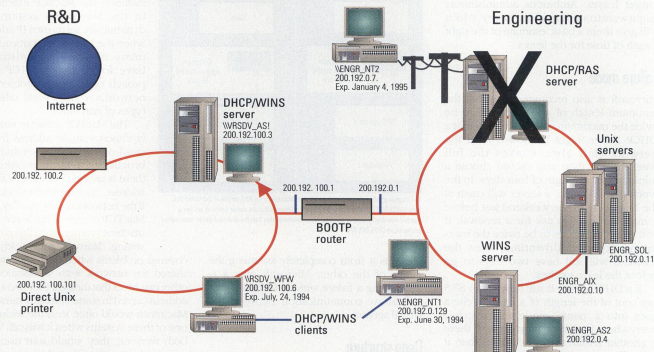
The next layer of Microsoft's addition to its network environment, WINS, allows computers to look up other computers by name instead of Internet address. If a machine moves, then it can still carry the same name with it if the WINS system tracks the move and changes the listing information. Naturally, this system must work closely with the DHCP server so that machines do not get lost as they roam from subnet to subnet.

After a client receives an IP address from the DHCP server, it sends a copy of this address and its chosen name to the WINS server asking for a listing. If all goes



The DHCP software was designed to live with any of the ambiguities caused by having two or more servers trying to supervise a network.

When a DHCP server goes off-line



In this hypothetical example, a DHCP server in the engineering department is off-line. You power up the desktop labeled \VENGR_NT1, and the BOOTP relay router relays a DHCPREQUEST message to the DHCP server (VRSDV_ASI) at address 200.192.100.3 in the R&D department. Because the scope of the R&D subnet is different, the VRSDV_ASI server gives it a new IP address at 200.192.0.129.

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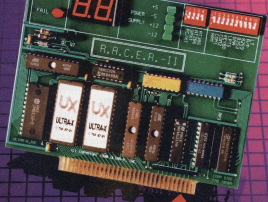
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Security

One of the subtle problems in any network environment is security. Any new automation system has the potential to open up doors for mischief. DHCP's automatic registration process makes it easy for you to hook up a laptop and tell the network that it's you. But it also makes it simple for someone else to do the same thing.

Network administrators will need to be aware of the potential for spoofing and users who might masquerade as others. Microsoft points out that this problem existed before. This is certainly correct, but the inflexibility of the old IP routers hobbled some of the efforts of spoofers. An administrator had to type in the MAC code from the network interface card on the machine into the IP address database before the spoof would be complete. The automatic registration process makes it



easier for someone to completely assume the network identity of another.

DHCP has enough of the old 'inflexible' IP configuration procedures built in to circumvent this problem if it occurs. It is possible, for instance, to direct the DHCP server to always give a certain IP address to a certain computer, although this defeats the purpose of the dynamic DHCP system.

Many network administrators will probably choose to ignore the problem of malicious users and choose the flexibility of a fully functional DHCP. The trade-off will certainly be worth it for many. DHCP doesn't introduce the problem of masquerading users, it just makes it slightly easier. The most secure environments solve the problem by using cryptographically secure protocols for establishing identity.

well, the WINS server responds affirmatively and sends a long time limit for the listing. The WINS listing must also be renewed like the DHCP lease.

The process may fail if there is another machine that has already reserved the name and IP address binding. At this point, the WINS server challenges the first computer to reserve that name to prove that it is the rightful user of the name. If that first user responds, then the server makes a simple choice to go with the first. There is no authentication or password system built into the current version of the system. Microsoft hopes to add a layer to do this in the future.

A fair amount of fault tolerance and flexibility is also built into the WINS protocol. If there are multiple WINS servers on a network, then they will coordinate their listings of names and swap new names. This broadcasts a name to the local WINS servers so someone can look up a distant name without sending packets throughout the Internet. It also provides some fault tolerance so that names to IP conversion will still be available even if one machine goes down.

The network administrator can set the amount of time between these swaps according to the load on the network. If the two WINS servers are on different continents joined by a low-speed, expensive link, then the coordination can be done once a day. If the servers are joined by an unsaturated local network, then they can constantly keep each other informed about new users.

Bringing you the world

Unfortunately, WINS is still a local solution to providing a name space. If someone from outside your company tries to call up and get the IP address of your computer, they won't be able to do it. This is important to do if someone tries to finger, ftp, or use a talk program with your local machine.

For instance, right now someone can type `talk pcw@access.digex.com` and the network routing software would decode this to get the net address of the machine `access.digex.com` before trying to initiate a talk command. This is because `access.digex.com` is published in the Internet's name tables. It's like getting the phone number of the person you're trying to reach, not the phone number of the receptionist.

But if I started running WINS and I registered my local name 'epinymous' with the WINS server, my IP address would not be available to anyone from the rest of the world. They would still need to send email through the gateway.

This is largely the fault of the Internet for using static tables with fixed addresses. If you want to publish a name and IP address to the world, then you need to ask DHCP to always give you a fixed address. Microsoft anticipated this problem and added this feature even though widespread use of it would largely destroy the dynamic nature of DHCP.

Microsoft is actively pursuing getting the wider Internet to accept dynamic naming

tables. In the future, it hopes that others will adopt a dynamic standard that will work with DHCP. The company is approaching the IETF (Internet Engineering Task Force) at this time, and it hopes to move toward a dynamically bound DNS (Domain Name Service) standard in the future.

As this proposal advances, you will probably see an expansion of the capabilities of WINS. At this time, it accepts NetBIOS names and addresses. The architecture is not limited to this complicated structure, and the IETF plans to expand the name space to include Internet names as well as any other naming conventions that emerge in the future.

For big networks

The DHCP/WINS combination is an excellent way to solve the irritating problem of introducing users to a network. The current systems that handle wide-area systems like TCP/IP require too much work by an administrator. The smaller network protocols like NetBEUI, IPX, or AppleTalk will not easily scale to large networks. Microsoft built this system to handle 250,000 people moving their laptops around from office to office without dealing with the local network administrator.

Smaller network users will probably not feel the need to adopt such a protocol. The low-end systems already offer all this flexibility as a side-effect. This may change with time, though, because the worldwide expansion of the Internet is rapidly making purely local networks an anachronism. Everyone will want to plug into this network and get their own IP addresses, even when there are only a few machines on the local network.

Microsoft's push to make the IP part of the foundation for Windows NT ensures that the Internet connectivity may be an attractive side-effect. Sure, in a small office you've got only a few users and the network administration chores are so small that you don't need the flexibility of DHCP. But, if it provides an easy way to create a gateway to the Internet, then the operating system may be more desirable.

The adoption of this system may give Microsoft a better competitive position against workstation manufacturers like Sun and Hewlett-Packard. The operating systems on these machines were built around TCP/IP long ago and the applications running on the system embraced the standard from the beginning. If Microsoft wants to push NT into the traditional domain of workstations, then it needs to talk the local language. It's made the commitment to this and now DHCP and WINS will give it a more flexible environment. ▲



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Extending the reach of OLE

BY KEITH PLEAS

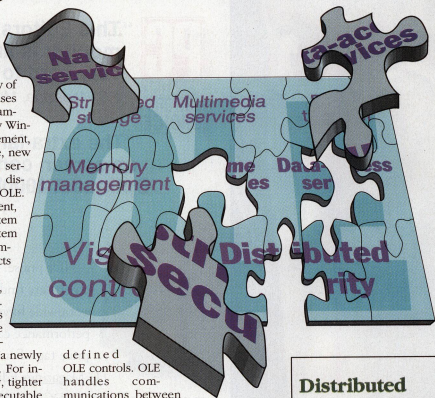
For Microsoft, OLE is the foundation not only of component software but also of future releases of Windows itself. OLE serves as a programming model for and provides access to key Windows services, such as memory management, structured storage, and data transfer. In the future, new services — including visual controls, multimedia services, data access services, name services, and distributed security — will be available only through OLE. As object-based capabilities become more prevalent, the distinction between applications and the system will start to disappear. Ultimately, the operating system itself will become a collection of replaceable components. OLE is the 'glue' that will bind these objects together.

By mid-1995, a more capable version of OLE, called Distributed OLE, will appear on the scene. Today, OLE objects may run in the same process as in-process, such as a separate executable file like Microsoft Excel. Under distributed OLE, objects will be able to run on another machine via a newly defined flavour of RPC (remote procedure call). For in-process servers, this will mean greater efficiency, tighter control, and fewer concurrency problems. For executable files, distributed OLE will bring improvements in process security while permitting objects to use existing code. Over a network, the whole programming model will change, and things such as shared specialised object servers will become possible. Such servers will have the ability to store graphic images that require literally hundreds of megabytes of memory to render, objects that require particular hardware (for example, digital signal processor, or DSPs), or databases that require specialised connectivity. (See the text box 'Cairo takes OLE to new levels'.)

OLE technology

Underlying OLE is COM (Component Object Model), the language that OLE speaks. It doesn't impose any restrictions on applications or say anything about how they're designed. Rather, COM facilitates interpretability between OLE components, including (in the future) those running on remote machines. OLE itself embodies the object services — such as visual editing, structured storage, and object conversion — that the system provides to facilitate COM interactions.

Component objects are exposed through interfaces, each of which is a group of closely related member functions. A component object can have any number of interfaces, each providing a well-defined service. All interface names begin with an I. IDropSource and IDropTarget, for instance, handle a drag-and-drop function in OLE documents. Idispatch controls OLE automation, and IOleControl and IOleControlSite are responsible for the recently



defined OLE controls. OLE handles communications between the interfaces.

The essential component object interface is IUnknown; all objects must support it and its three base member functions: QueryInterface, which is used to obtain pointers to interfaces, and AddRef and Release, which are used for reference counting over an object's lifetime. All other COM interfaces are derived from IUnknown. They are not inherited, which has myriad religious object-oriented connotations, because interfaces are independent of implementation. Their purpose is to enable interface pointers that shield the component object. These pointers are 128-bit integers that are virtually guaranteed to be globally unique, even in networks with millions of objects.

The separation of interface and implementation lets you replace or modify the code for a particular implementation without making any changes in the objects and systems that call into it. You can also add new interfaces without breaking existing applications, which is what component software is all about. Clients see only interfaces; what exists behind the interfaces is opaque, even though the internal representations may be handled as if they were true objects. Put another way, what you think of as a Worksheet object in Microsoft Excel does not, in fact, exist. Rather, it's a useful abstraction. Excel supports a set of interfaces to something that it calls a Worksheet. How Excel manages that Worksheet is something only those inside Microsoft will ever know.

Distributed OLE promises cross-platform capabilities for linking component software

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Cairo takes OLE to new levels

The next version of Windows NT, code-named Cairo and targeted for release sometime in 1995, will be built around the concepts of objects and component software. It will have a native OFS (Object File System) and distributed system support.

In addition to incorporating the Chicago user interface, the Cairo shell will include integrated OLE controls contained within OLE Forms. The entire system will be built from component objects (for example, Desktop, Explorer, Tray, Folder, User, Scraps, Property pages, and Toolbar). New system services will appear as system

component objects. Cairo will also support custom objects that enhance the operating system.

Cairo will extend OLE structured storage to the computer's native file system, implementing a complete OFS with support for link tracking, space management, and content and property indexing. Standardised stream names and formats will let you view data inside files. Distributed systems support in Cairo includes link tracking across networks, network directory services, distributed files systems, and support for distributed events.

Monikers and binding

So, the minimum COM object is very lightweight. This is fortunate, because COM objects are used for virtually everything in OLE. A perfect example of this is the OLE naming object called a moniker, which implements the **IMoniker** interface. Monikers are used for the names of link objects that the system recognises. They are more efficient at representing data than, for instance, filenames, although, for convenience, monikers can use the **GetDisplayName** member function of **IMonikerD** to generate a text-display name readable by humans. Human-readable names are stored locally to prevent problems with name collisions over a network.

The basic purpose of a moniker is to bind an object to a discrete piece of data. What's returned is an interface pointer to the linked object. When it's asked to render itself, the object can go through that interface pointer to ask for an updated presentation. A moniker, and thus its pointer, can be stored persistently; the object is activated and bound only when it's required. When activated, a moniker uses the ROT (Running Object Table), described later, to locate existing instances of the object. Indirectly, through the Service Control Manager, monikers may also use registry information to instantiate objects if they are not present in the system.

Distributed OLE offers three main types of monikers: file monikers, item monikers, and composite monikers. A file moniker can identify any object that is stored as an individual file and act as a wrapper for the path name that the native file system as-

signs to the file. For example, **C:\DATA\BUDGET.XLS** might be the file moniker for an Excel workbook object stored as a file on disk. Calling the **BindToObject** function for this moniker would launch Excel (if it weren't already running), load this workbook, and return a pointer to it. Binding can have a significant impact on your system.

Item monikers identify an object contained within another object. The exact format varies by application and the corresponding nature of the application's data, but an Excel example might be **Sheet1!A1:D20**. A composite moniker is composed of two or more monikers, concatenated. For example, a composite moniker could be constructed from the above file and item monikers. You can see the human-readable version of a composite moniker such as this when you create a linked item (for example, Copy . . . Paste Link); the moniker is embedded into the linked item. A composite moniker is bound in right-to-left order, which avoids unnecessarily activating objects if a pointer to an intermediate-level object already exists. In contrast, activation — the act of running an object to perform an operation — generally occurs in left-to-right order.

To bind a moniker, the link source must be running. To handle this efficiently, OLE maintains yet another COM object, the ROT that implements the **IRunningObjectTable** interface. If an object doesn't register itself in the ROT when it starts running, extra copies of the object might be loaded if other objects try to bind to it. This would lead to consistency problems and, ultimately, to the loss of

data. The ROT is local to a desktop and maintains a list of all objects running on that machine. In a Distributed OLE environment, which lets you bind objects on remote machines, the ROT becomes more of an abstraction.

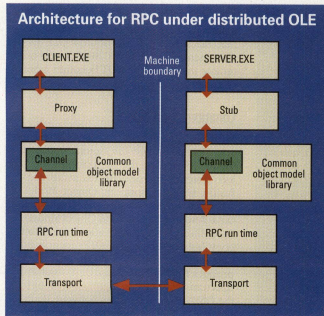
Common Object Model

Microsoft and DEC have defined a specification, called the Common Object Model, for making the two company's object systems interoperate (to avoid confusion with Component Object Model, whose acronym is also COM, I will spell out references to Common Object Model). In defining the specification, Microsoft contributes a subset of its OLE technology, and DEC supplies its ObjectBroker product for implementing UDT (uniform data transfer) by using minor extensions to the OSF-sponsored (Open Software Foundation) DCE (Distributed Computing Environment) RPC system. UDT uses the **IDataObject** interface, which encapsulates the various methods for exchanging data between applications. Current methods include using the Clipboard, drag and drop, and OLE Automation. This particular RPC implementation is called ORPC (Component Object RPC).

Prior to the creation of the Microsoft/DEC specification, Microsoft developed an equivalent RPC version for doing networked RPC (but not networked OLE RPC) under Windows NT. This implementation was called Microsoft RPC, and this name still appears in the Win32 SDK (Software Development Kit) and in Microsoft presentations at developer conferences.

Obviously, to take advantage of support for distributed OLE, a remote machine must support OLE. That support is already available in PCs running the 16 or 32-bit version of Windows and on the Macintosh (680x0 and Power Mac), and Microsoft is licensing its OLE source code to Unix vendors. When OLE support becomes available on Unix systems, the Microsoft/DEC Common Object Model will provide a means of fostering enterprise-wide cooperation — across networks and across platforms — between OLE applications and objects. Existing local-based OLE application should get this capability without additional programming, because all objects appear local.

The system-level code that implements the Common Object Model functions is called the Common Object Model Library. It handles the creation of Common Object Model applications and the specialised objects required for distributed object support. The Common Object Model Library also encapsulates the channels over which the network RPC takes place. The system-



The diagram gives an overview of the system architecture of the RPC portion of Distributed OLE. Note that CLIENT.EXE talks only to the proxy; it is unaware that the server functions are being handled remotely by another machine. All components other than the client and server executables are based on OSF's DCE RPC.

level code that handles the actual transmission is the RPC run-time library, which runs in both the client and server process (see the figure 'Architecture for the RPC Under Distributed OLE').

Each machine has an SCM (Service Control Manager). The SCM is an RPC server that acts as the central point for object activation. It ensures that a server is started in response to a client request. To do this, it must maintain the ROT and a local cache of system-registry class information for use by the Common Object Model Library.

The SCM controls the type of an object server: in-process, cross-process (local), and distributed cross-process. If the requested server is an in-process DLL, the SCM passes the request to the Common Object Model Library for loading. When a local (on the same machine) cross-process request arises, the SCM passes the request to the server if it's already running or creates the server process if it isn't. For a remote cross-process request, the SCM forwards the request to the SCM on the server (see the figure 'SCM and Distributed OLE').

Marshaling

Before you can make an RPC, you need one more fundamental piece of OLE technology: marshaling, a method for packaging the function calls and parameters, passing them across the process boundary, and unpackaging them at the other end. Marshaling takes care of details like how each of the possible parameter types is

passed. Marshaling also converts data into a binary stream format and packages it for RPC transmission, using Network Data Representation to make differences such as byte ordering and character sets compatible.

Two types of marshaling for interface pointers exist: standard and custom. A server object has to support one or the other but may not support both. Standard marshaling support is provided for all the standard COM interfaces; the support proxies and stubs are loaded from OLE-PRX32.DLL, and the server does not implement the **IMarshal**

interface. Custom marshaling handles a particular set of circumstances. Monikers, for example, require marshaling by value, so a copy of the server object is created in the client process and changes made to it are not reflected in the server. Custom marshaling is also required when memory is shared — when the name of the memory segment is passed to the client. Compound files are marshaled in this way. Custom marshaling requires implementing custom proxies and stubs for the server object (see the figure 'Distributed OLE architecture' on page 155).

Proxy and stub

Crossing a process boundary or machine boundary for distributed-object RPCs involves a process called interface remoting. To permit you to cross boundaries transparently, proxy and stub objects translate local procedure calls into remote procedure calls.

The proxy runs in the client process, between the client and the server object. It supports identical interfaces, called interface proxies — one proxy per interface — as the server object, though their implementation differs. As its name suggests, a proxy's function is to marshal (package) the interface parameters for its server interfaces and pass that package via an RPC (using the RPC run-time libraries) across the network to the server object. There, the package is unmarshaled.

The steps are transparent to the client. The stub, the counterpart of the proxy on the server, unmarshals the server interface

calls. It runs in the server process and is similar to the proxy in that it provides an encapsulation of the server's interfaces (as with a proxy, each interface is allocated one stub).

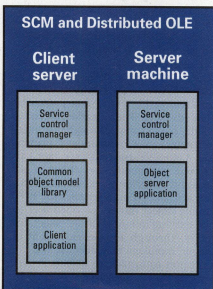
MIDL

Because C data types may be different sizes on different systems, a special-purpose C-like language and compiler are required to generate the data types and declare statements used in an RPC. The DCE calls this the IDL (Interface Definition Language), and Microsoft's particular implementation is called, not surprisingly, MIDL.

Microsoft-specific changes to standard IDL support custom Common Object Model interfaces to handle object references, string bindings, reference counting, path resolution, new object creation, and object activation. The MIDL compiler creates code for talking to the RPC run-time library for each interface definition: proxy/stub code, header files, and an interface identifier file. The proxy/stub DLLs, which must be installed in the system registry, are built from these files.

Distributed security

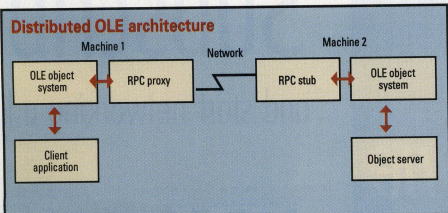
The security of objects and the data they encapsulate is a matter of concern in any object system. In distributed systems, security is more important than it is for local systems, where it is often taken for granted. OLE offers relatively limited security; when multiple clients are accessing one server, a separate instance is run



The SCM plays an important role in the Distributed Object RPC architecture. Note that each machine has an SCM, which manages that machine's ROT (running object table) and a local cache of system-registry class information for use by the Common object model library.

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The diagram shows where OLE integrates with Distributed Object RPC. OLE is isolated from network operations.

for each client. So, each client/server connection, and thus the data being transmitted, is isolated from that of other client/server connections.

Distributed OLE will provide improved security through the connection ORPC offers to DCE. These services are accessed by applications through the Common Object Model Library, which checks flags in the system registry to control where a server can be run. Object servers may run where the client is running, where the data is stored, or elsewhere on the network.

In distributed object systems built on DCE (for example, ORPC), authenticated RPC and DCE Security Services provide security. Under authenticated RPC, DCE automatically contacts the Security Server to obtain authentication for the client in the form of a Privilege Attribute Certificate, which contains identity and group membership information. The protocol for authentication is based on the industry standard Kerberos 5 authentication system developed at MIT.

Open tools

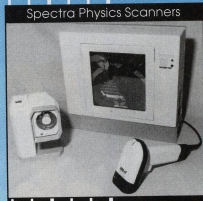
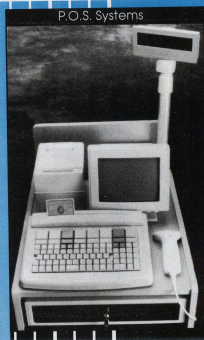
To alleviate concerns about OLE being too proprietary, Microsoft has made it part of WOSA (Windows Open Services Architecture), whose stated goal is providing "an open environment for the development and use of windows-based applications". WOSA components include common application services (Open Database Connectivity, MAPI, the Telephony API, and Licensing Service API); communication services (Systems Network Architecture, Windows Sockets, and Microsoft RPC); and WOSA extensions for vertical markets (Financial Services and Real-Time Market Data). Microsoft has also licensed OLE source code to several vendors, including Locus Computing, Mainsoft, and Insignia Solutions. These companies will provide OLE capabilities on diverse Unix platform forms.

Ultimately, however, the success of OLE — distributed or not — depends on more than Microsoft's willingness to maintain an open-door policy. One important factor is the quality of the tools available for creating new applications. (Distributed OLE promised to eliminate the need for changing *existing* OLE applications.) After all, applications are only as good as the tools used to create the objects. Right now, your choices in tools for creating server applications boil down to just one product: Microsoft Visual C++ 2.0.

Despite its advertised openness and language independence, for most developers OLE will be approachable only if it's encapsulated in a framework like Microsoft Foundation classes. Implementing this encapsulation is such an enormous and expanding undertaking — volumes 1 and 2 of the *OLE2 Programmer's Reference* total more than 1200 pages and don't even include OLE Controls — that eventually all C++ tools vendors will probably license the code from Microsoft. As extensions are added to OLE, though, it's a safe bet that Microsoft tools will be the first to provide access to those services.

In the component service world that is just emerging, high-level integration languages play an important role, too. To create and use OLE objects, a programming language must create structures of pointers and explicitly or implicitly call functions through those pointers. Microsoft's Visual Basic, for instance, can do this. It manages the pointers internally and provides high-level mapping between language objects and OLE objects.

However, just as using a framework today is no substitute for understanding the Windows API, no encapsulation will completely eliminate the need to understand the OLE equivalent: the assorted OLE interfaces. Developers investing in OLE development today will be well positioned for the 'OLE Everywhere' of tomorrow's distributed OLE environment.▲



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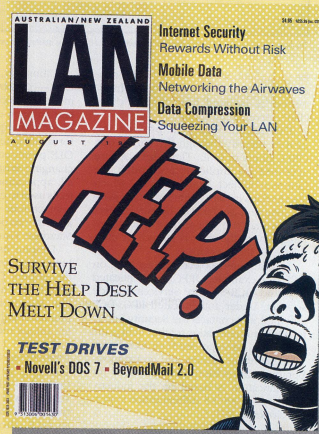
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2. Comdex/Sucesu, Rio de Janeiro, **Brazil**. 4th-7th April.
3. European Computer Show, London, **UK**. 10th-12th April.
4. Comdex Spring, Atlanta, Georgia, **USA**. 23rd-26th May.
5. Computex Taipei '95, Taipei, **Taiwan**. 2nd-6th June.
6. PC Show, **Singapore**. 15th-18th June.
7. PC Expo, New York, **USA**. 28th-30th June.
8. Network + Interop, Tokyo, **Japan**. 25th-29th July.
9. Network + Interop, Paris, **France**. 6th-10th October.
10. Comdex Fall, Las Vegas, Nevada, **USA**. 14th-18th November.

Windows becomes LAN friendly

BY BARRY NANCE

Windows 3.x has made LAN administrators' lives miserable over the past few years. The 3.x versions of Windows aren't easily integrated into corporate LAN management infrastructures and don't provide system access interfaces to PC inventory and configuration information. Third-party LAN management products from vendors like Saber Software can't provide complete, open solutions to LAN management problems with Windows 3.x. With Windows 95, Microsoft set out to provide an environment that would easily mesh with current and future LAN management technologies.

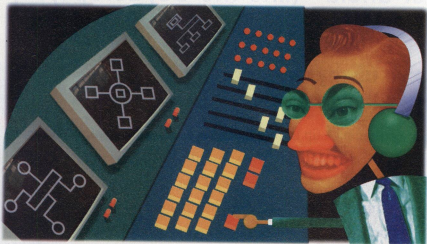
LAN management functions include taking inventory, monitoring traffic, detecting viruses, distributing software, monitoring applications, metering software licenses, mapping the network, notifying administrators when errors occur (that is alerts), and creating trouble tickets for help-desk resolution. Remote access to the LAN management functions is a plus, as is the ability to globally modify workstation configuration files from a central site. Windows 95 offers features, some built into windows and some available as APIs for third-party LAN management software vendors, in almost all these LAN management categories.

Opening the cache register

Windows 95 uses its Registry to store LAN management details. The operating system also provides programming interfaces that can present LAN-oriented Registry information in formats that LAN management products expect. The Registry is a hierarchically organised system file containing configuration information, driver settings, operating-system parameters, use option choices, and other data. The Registry takes the place of the Windows 3.x-style INI files, although Windows 95 still keeps INI files around for backward compatibility with 3.x applications.

The heart of Windows 95's new resource management features, the Registry supplies information about network hardware (both Plug and Play and legacy devices), authorisation levels (that is, permissions), user profiles, network protocols, installed software packages, recent backups, and shared resources (including drive letter mappings, printer queue preferences, and whether the workstation can act as a peer to share its resources with other PCs).

The information the registry stores is exactly the kind of information LAN administrators need to manage LAN-attached, Windows-based PCs. To help administrators get at the information, Windows 95 lets administrators remotely view and modify a PC's Registry through the LAN cable or through a dial-up telephone connection. For management through the LAN cable, Windows 95 offers an RPC (remote procedure call)



interface that LAN management products can use to access the Registry. An administrator can even set (or reset) a Windows 95 PC's configuration, including screen colours, from a central console.

If you have hundreds or thousands of PCs and you upgrade them to Windows 95, you'll be able to set what Microsoft calls System Policies. With the System Policies editor or a third-party administrative tool, you set up configurations, restrictions, and other global corporate standards that you want to apply to all PCs. When a Windows 95 PC logs on to the LAN, Windows 95 looks on the network for the policies from the network, applies those policies, and continues with the log-on process. An administrator can, for example, selectively remove system capabilities such as per resource sharing from a group of PCs. People using those PCs then won't be able to make their hard disks publicly available.

Through user profiles stored in the Registry, Windows 95 makes it possible for different people to share a pool of desktop computers and see a consistent Windows configuration no matter which machine the person might use. With its user-level pass-through security features, Windows 95 restricts the ability to make configuration changes to the LAN administrator and people specially designated by the administrator.

Windows 95 software components (for example, Plug and Play configuration manager, applications, operating-system shell, device drivers, and operating-system services) store system configuration information in the hierarchical structure of the Registry. A separate user-profiles structure within the

**Windows 95
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Registry holds information about each person who uses the PC. Windows95 interfaces (for example, RPC, SNMP, DMI, peer services, and backup services) allow over-the-wire access to the information in the Registry. The RPC interface enables remote access, the peer services interface controls resource sharing within the PC, and the backup services interface lets administrators perform remote backups of Windows95 PCs.

Plug and Play

To make installing and configuring new PC hardware components simple and almost foolproof, Plug and Play tracks system resources (for example, DMA channels, IRQs [interrupt requests], base I/O addresses, and UMB [Upper memory Block] use) as well as device-driver configuration settings. The Plug and Play configuration manager stores the information in the Registry.

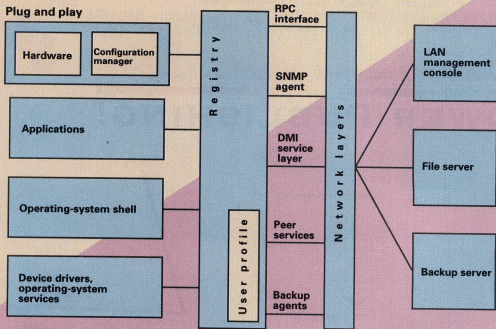
For the new Plug and Play hardware you buy, the obvious benefit is quick, easy configuration. For LAN administrators, the Plug and Play information becomes a valuable source of inventory detail, detail that's available over the wire to LAN management software products.

SNMP, DMI and CMIP

Different LAN management products accept over-the-wire resource information in different formats, using different protocols. Using the information stored in the Registry, interfaces built into Windows95 provide resource management information required by those different third-party LAN management products.

For management products expecting data through SNMP, Windows95 includes an SNMP agent. SNMP is a popular Internet protocol for sending network management information from one computer to another. The Windows95 SNMP agent is patterned after the Windows NT SNMP agent and consists of a 32-bit Windows software module. Network management products such as Hewlett-Packard's OpenView and Novell's NMS (Network Management System) can accept data via SNMP. Windows95 can send the SNMP

Windows95 software components



The Plug and Play configuration manager reflects hardware component settings in the central Windows95 registry. Applications, the operating-system shell, devices, and operating-system services also store the information in the Registry. Through RPC, SNMP, and DMI agents, Windows 95 makes the information in the Registry available to LAN management products. Administrators can restrict peer disk and print sharing, and they'll be able to use third-party backup copies of workstation files as well as server files.

messages over the IPX transport layer or the TCP/IP transport layer.

Windows95 invokes a *MIB handler*, which converts the information in the Registry into MIB (Management Information Block) format, and the SNMP agent transmits the MIB data to the requesting remote management console. Because each LAN component can have a completely different MIB format, Windows95 needs a different MIB handler for each component. The MIB handler extracts data from the Registry, puts the data for that component into the appropriate format, and hands the data to the SNMP agent for transmission across the LAN cable. Microsoft claims that writing MIB handlers will be an easy programming task. At the time of writing, the MIB handler specification has not been completed.

DMI is an emerging standard for how LAN management products describe and control the components in a desktop computer. DMI doesn't address how the information crosses the LAN cable, but rather how the management products interface to and describe the PC components.

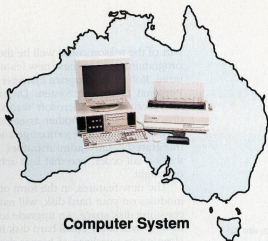
Microsoft will supply a DMI SL (Service Layer to the registry) interface will reformat information in the Registry into DMI's MIF (Management Information Format).

The DMI specification defines the contents of the MIF files produced by the component-level modules; describes the

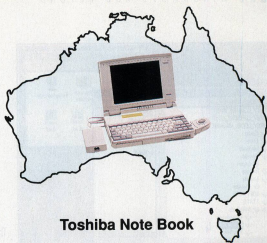
MI (management interface) through which software can issue commands to query, reset, or control components; provides an SL that implements the MI and directs the activities of the various DMI modules; and identifies the CI (component interface) that a LAN product vendor can use to provide querying and controlling access to its product. Not only can the CI respond to commands, but it can also generate event notifications (called *alerts* in some LAN management products). Microsoft supplies the SL; third-party vendors will have to supply the other pieces of DMI.

Microsoft is hedging on whether DMI support will appear in the initial release of Windows95. However, the company says you'll be able to get Windows95 DMI support by downloading Windows95 patches and updates from a variety of electronic sources (such as CompuServe) soon after the release of Windows95. The group of companies promoting DMI, called the DMTF (Desktop Management Task Force), has already created DMI software components for DOS, Windows 3.x, and OS/2 workstations.

An alternative management protocol that's part of the OSI standard, CMIP, won't appear in Windows95 at all. Microsoft says that a CMIP agent would consume a considerable amount of system resources (primarily memory and CPU). CMIP isn't in wide use yet, and customers aren't asking for CMIP in Windows95.



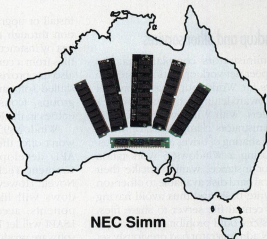
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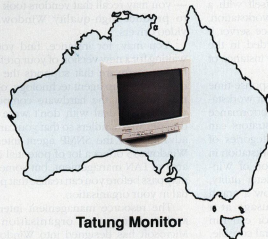
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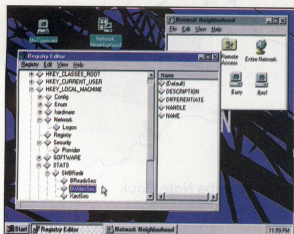
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The Registry editor lets you view and modify Windows95's central repository management data

Peer, backup and other services

LAN administrators complain that the peer-to-peer network operating system in Windows for Workgroups has a cavalier attitude toward letting people share drives and printers. With Windows95, Microsoft lets administrators clamp down on indiscriminate sharing of drives and directories. People using a Windows95 workstation might, for instance, want to make their entire local hard disk available to others on a read-write basis and thus avoid having to use a central file server to share files. Windows95 would prohibit the operation if the LAN administrator had previously set up peer sharing restrictions.

Even after the fact, an administrator can (from a central console) close files and delete existing peer connections that he or she finds inappropriate. Windows95 gives administrators virtually the same control over peer resource sharing that those administrators have over departmental file servers. An enhanced version of the Windows for Workgroups NetWatcher module gives administrators remote control and management of peer resource sharing.

Windows95 includes backup agents for Chenyenne's ARCserve and Arcada's Backup Exec. A backup agent is a specially designed peer sharing function that makes a workstation's files available, just for backup purposes, across the LAN. The backup agents give administrators the ability to make copies of a workstation's files via a central backup scheme. Chenyenne and Arcada, for their part, have announced they'll modify their products to interface with the backup agents in Windows95.

Backup agents are bidirectional in the sense that remote software distribution and installation can occur through the backup agent interface. With yet-to-be-developed third-party software distribution utilities, administrators will be able to

install or upgrade software on a workstation through the backup agent interface just by instructing the backup agent to pull files from a central file server. Windows95 also has provisions for configuring the installed software, including new program groups, icons, and application-specific entries in the Registry.

Windows95, at least in its initial release, won't offer the LSAPI (Licensing Services API) developed by Brightwork, DEC, Gradient Technologies, Microsoft, and Novell. However, future versions of Windows will likely contain LSAPI components, according to Microsoft. The LSAPI will let LSAPI-enabled applications software products monitor and control the number of concurrently in-use instances of those applications. Through the LSAPI, an application can register itself with a licence server. When run on a workstation, the application asks the licence server if the licence agreement recorded in the licence server permits another instance of the application to run.

People often perceive a response-time or performance problem at their workstations. Windows95 includes a Performance Monitor module that administrators can use to see the types and categories of resource use occurring at a workstation in real time. An enhanced version of Windows for Workgroups' WinMeter utility, Performance Monitor, can show a graph of, say, file I/O and CPU usage at a workstation. The administrator can run Performance Monitor at a central console, indicate which workstation to monitor and which statistics to graph, and then analyse that workstation's workload in real time.

The costs of resource management

The resource management features of Windows95 are several orders of magnitude richer than those provided by earlier versions of Windows. If Microsoft is late and misses its announced release date of December 1994 for Windows95, a big

part of the reason could well be the extra programming effort these new features require. Rob Price, program manager in the Personal Operating System Division of Microsoft, says: "Microsoft wants Windows95 to be just another asset on your network that's simple to manage and well integrated." LAN administrators know that's a tall order, one that isn't achieved overnight.

The new features, in the form of code modules on your hard disk, will naturally consume disk space. An upgrade to Windows95 will likely entail hard disk housecleaning or purchase of bigger drives to accommodate the additional 35M that Windows95 requires.

As you load and run Windows95, you'll notice that these features — especially the new agent modules — use additional RAM, perhaps as much as 300K. You may need to buy additional memory for those workstations. And you may notice that workstations don't seem quite as peppy when running Windows95; the new features will need to use some CPU time to get their work done.

Perhaps the biggest cost of these new resource management features is the risk that not all third-party LAN management product vendors will embrace the new interfaces right away, or not all vendors will do so with bug-free software. The development of resource management drives and utilities for Windows95 closely parallels the Windows 3.x video driver development situation of a few years ago — you may recall that vendors took years to produce high-quality Windows 3.x video drivers.

You may, for instance, find yourself waiting for a new version of your preferred backup software that supports the Windows95 backup agent technology, or you may find that the hardware component vendors you deal with don't write Windows95 MIB handlers so that you can take advantage of the SNMP agent interface. Windows95 offers a lot of potential in the area of LAN management, but some time may pass before you can realise that potential in your organisation.

The resource management interfaces and resource data organisation that Microsoft has designed into Windows95 represent a strong reaction to the complaints from LAN administrators about Windows 3.x. If third-party vendors rise to the occasion — and early signs indicate that they will — Windows95 PCs will easily manage assets on a LAN. To take advantage of Windows95's new management features, a PC will likely need more RAM and CPU power. However, the benefits of the rich set of Windows95's management facilities may well make the extra cost worthwhile. ▲

MAPI blooms in Chicago

BY TOM SHELDON

If the Earth is ever conquered by aliens, we may be forced to adopt their technology standards. That will be a relief for network administrators, who are trying to figure out what direction they should take with messaging systems. In the meantime, Microsoft's MAPI (Messaging API) appears poised to make Chicago a universal email client, enabling potentially any Windows application to interoperate with a variety of back-end mail systems.

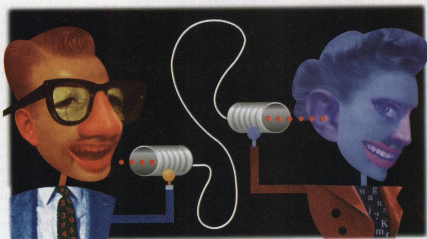
Email and messaging in general are critically important to enterprise computing. The Electronic Messaging Association predicts that the number of email users will triple in 1995, with 25 million users sending 15 billion messages a year. Messaging goes well beyond the exchange of email. It is a key component of groupware and work-flow applications, which allows applications to exchange information automatically. For example, the approval of a sales order by a manager might initiate a forms-routing sequence over the network. Messaging also provides a way to get information from a system with an email message and receive a reply.

MAPI solves a critical problem for developers by separating the messaging requirements of applications from messaging services with an intermediary layer called the MAPI subsystem. Windows applications can use MAPI calls through the subsystem to interact with any MAPI-compliant messaging system. MAPI eliminates the need of the client application to know how a particular messaging system provides services. Companies can use MAPI to build on existing messaging systems or install new ones.

MAPI is part of Microsoft's WOSA (Windows Open Services Architecture), which Microsoft calls "a blueprint to establish Windows workstations as universal clients that fit seamlessly into heterogeneous corporate computing environments". WOSA extends the Windows API set to give desktop applications access to many types of back-end services. The other components of WOSA include ODBC (Open Database Connectivity), as well as network file services, print services, and licensing services.

By providing transport independence, MAPI lets organizations continue to use their existing messaging services while migrating users to Windows-based messaging applications. With MAPI and Chicago, you can integrate a diversity of messaging applications on the desktop. Through Chicago's InfoCenter, for example, you can potentially access email, faxing voice mail, BBSs, and online information services like CompuServe. In fact a single inbox can serve all these applications and any underlying messaging system.

Microsoft chose a client/server approach for MAPI to help reduce bottlenecks that increased messaging generates on a LAN. A client/server architecture distributes



tasks between the client side and the server side. Servers store the procedures and executable modules most commonly used by clients.

Using RPCs (remote procedure calls), clients call the procedures and servers return the results to the client. Because the executable code for the procedure is already at the server, the client just needs to send a command to invoke it. This dramatically reduces the I/O between individual users and servers and helps reduce network traffic. The store and forward nature of messaging complements the RPC method of client/server interaction in the network.

Management is also simplified with the client/server architectural approach when commonly used procedures and information are stored at a single server. You can upgrade these servers to high-performance systems to further boost messaging performance. When messaging services are based at a central location, they tend to be more consistent and up-to-date. For example, global directories and document-conversion routines are easier to maintain and update if they are located in one place.

Front and back

MAPI provides programming interfaces for two classes of software systems. Front-end applications use MAPI to access messaging services, and back-end systems make their services available to front-end applications through the MAPI functional layer. Essentially, if you create a MAPI-compliant user application, it will interface with any MAPI-compliant messaging system. Likewise, if you create

Microsoft's MAPI, with wide industry support, is set to be the desktop messaging standard.

back-end messaging systems, you simply make the services MAPI-compliant. In the past, the developer of a workgroup application had to create a version for each messaging system that customers might use. (see the text box "Programming with MAPI" on page 170.)

MAPI does for messaging what the Windows printer system did for printing. The printer system separates the printer driver from the application, so developers don't have to write printer drivers for every printer on the market. Instead, printer drivers are included with Windows or supplied by printer manufacturers. In the same way, MAPI separates messaging applications from back-end messaging systems.

David Knight, vice president of marketing-system vendor Isocor uses the analogy of a stereo system. "The amplifier has all sorts of switches and can modify and route signals, but it has two sets of jacks: the RCA jacks for plugging things in, and the speaker jacks for connecting the speakers. That is very analogous to MAPI, which is a whole subsystem that sits under your client in your desktop. You carry it around with you in your PC. Applications are on one side, and an output provider module — at least one — is on the other side. The provider modules are like the speakers of the stereo. You can play any kind of music, the speakers don't care."

MAPI architecture

MAPI is an architectural approach, not just a set of APIs. It exists as a subsystem of the entire operating system. Developers must write MAPI-compliant client applications to one of three client-side interfaces: CMC (Common Messaging Calls), Simple MAPI or Extended MAPI. MAPI defines four groups of services that are accessible by MAPI-compliant applications: the message store, address-book management, message transport services, and configuration management.

Both Simple MAPI and CMC were designed with simplicity in mind. This lets developers quickly and easily provide mailing enabling features in their applications. CMC is a cross-platform component that is available for Windows/DOS, Macintosh, and Unix systems.

Extended MAPI was designed to create

What MAPI does

- **Manage message routing via a common user**
- **Manage message stores**
- **Manage address books for one or more messaging systems using the same user interface**
- **Manage different messaging transport systems**
- **Perform message store-and-forward functions if a message system is unavailable**
- **Notify of message delivery or sending**

message-intensive applications like work flow, data collection, and message management. It uses an object-oriented design and provides access to a variety of public and private message stores. Extended MAPI also supports high message volumes and complex addressing requirements. Developers can write to any of these interfaces to create applications that work with any back-end MAPI service provider.

Microsoft categorises client applications in three general groups. First, messaging-aware applications are those that don't require messaging services. However, they let you customise the interface to include messaging options on menus.

The 'send' option on the File menu in Microsoft Word for Windows is a good example of a MAPI customisation. Second, messaging-enabled applications are those that require messaging services (for example, Microsoft Mail) and that typically run over a network or on-line services.

The third category covers messaging based workgroup applications (for example, Workflow software), which operates over a network and makes extensive use of message stores, address books, and message-transport functions. These three categories correspond to CMC, Simple MAPI and Extended MAPI.

Microsoft recommends that software developers use CMC when creating cross-platform, message-aware applications that don't need to support a previous version of Simple MAPI. You would use CMC or Simple MAPI to add messaging features to nonmessaging application (for example, a word processor or spreadsheet). Use Extended MAPI if an application is dependent on messaging and requires message stores and address books.

CMC and Simple MAPI

The X.400 API Association (XAPIA) developed CMC after work done by Microsoft on Simple MAPI. Many vendors are implementing CMC. It replaces the Simple Messaging Interface in VIM (Vendor-Independent Messaging) 2.0. Because MAPI and VIM support CMC, developers can write mail-enabled applications to a single client interface. CMC also provides a level of interoperability between MAPI and VIM.

CMC provides a basic set of 10 function calls, including send, receive, and address lookup. XAPIA is working on a new version, CMC 2.0 which will provide more complex messaging (for example, document attachment and directory-synchronisation services). It should be available late this year. Such advanced functions were left out of the original specification to promote wide acceptance from vendors wanting to add their own custom features.

Simple MAPI is designed for Windows-only applications. Its messaging functions provide features such as send, address, and receive messages. (See the table "CMC and Simple MAPI functions" on page 175). Simple MAPI also supports the attachment of files and OLE objects to messages. With

file attachment capabilities, Simple MAPI can be used to create forms routing programs. Windows' Schedule+ groupware accessory uses Simple MAPI to exchange schedules among users. Microsoft Word, Excel, and other applications also use Simple MAPI message features.

One of Simple MAPI's limitations is that it has a single-folder message store. In Microsoft Mail, this translates to the Inbox. Extended MAPI provides a hierarchical storage structure that allows folders within folders

and the integration of message stores from different messaging systems.

Extended MAPI

Extended MAPI goes well beyond the simple mail-enabling APIs available in Simple MAPI and CMC by using object-oriented programming methods for its mes-

Extended MAPI

- **Access arbitrary properties in messages and recipients**
- **Customise messages and message formats using properties**
- **Develop custom features for address books**
- **Notify of events**
- **Access and search the folder hierarchy**
- **Perform MAPI memory management**
- **Substitute custom forms, such as a time sheet or calendar**
- **Provide 'smart-form' capability, which links field information on custom forms with other applications**

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saging functions. Messages, folders, and attachments are objects that you access through MAPI object structures. When a calling program opens an object, it gets a pointer to reference the object for future use.

While each object type allows different calls or operations, many calls can be made to different objects (that is, polymorphism) to reduce the development time and code required for applications. According to Microsoft, the MAPI object model is consistent with both present and future object-oriented models for Windows, recognising each service-provider DLL as a separate object.

Messages are stored in the hierarchical MAPI messages store, which is organised into a tree of folders. Messages can have attachments, such as complete files or file pointers, MAPI messages, and arbitrary binary data (for example, sound or images). Folders, messages, and attachments are made up of properties that store data values, such as the time a message was sent, user name, subject material, and other information.

The value of the properties may be in the form of text, numbers, dates, or binary information. This use of properties simplifies message exchange with other

Transport-provider

- Verify credentials, as the underlying messaging system requires
- Access outbound messages passed by the spooler
- Translate message formats, as the messaging system requires
- Generate delivery or nondelivery reports
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- Pass incoming data to the spooler.

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SRC-1702	17" F.S. 0.26mm	24-82KHz	1600 x 1280(NI)	Yes	Yes
SRC-1703	17" F.S. 0.28mm	24-64KHz	1280 x 1024(NI)	OSD	Yes
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messaging services. It also provides a way to create custom properties for workgroup applications or other special-purpose applications where messages have special significance for the application or its users.

The messaging subsystem

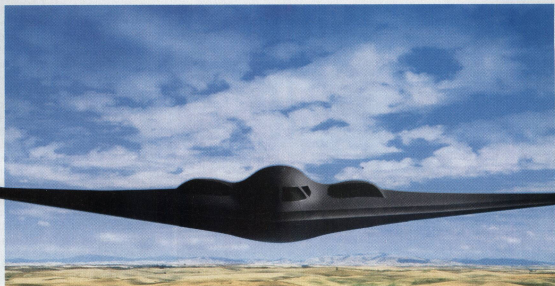
The MAPI messaging subsystem provides functions for creating a common user interface to send, receive, and save message delivery. The subsystem also provides functions for managing message stores, address books, and access to different transport providers. MAPI's services operate in the background. Because they take place when the foreground application is idle, they have little effect on system performance.

When a user logs on to a MAPI-compliant application, MAPI.DLL is loaded. It includes a message spooler that queries service providers to determine what functions and services are available for the application. MAPI.DLL receives calls from applications that use CMC, Simple MAPI, or Extended MAPI and routes messages to the appropriate message-stores as they are created, and you access the address book to choose recipients for the message.

When the user or an application submits the message for delivery, the message spooler examines the message address and exposes the message to available transport providers, one of which may take on the task of delivering the message, if appropriate. The messaging subsystem can store messages and forward them when a particular messaging service becomes available. It thus operates as a clearing house for messages.

A security feature authorises user access to messaging services. Users are verified (by user name/password) when they access a MAPI-related option, either the first time they make that access or every time, depending on the level of security required. For some operating systems (for example, Windows NT), greater security is

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Programming with MAPI

BY TOM SHELTON

All MAPI interfaces are available in both 16- and 32-bit versions to support the Windows family. You can call MAPI functions from C or C++ programs through scripting packages like Microsoft Visual Basic or by using the macro languages in Microsoft Excel or Word for Windows.

The MAPI programming architecture includes the session, the message store, and the address book. MAPI clients must establish sessions with the messaging subsystem before they can interact with the messaging stores and address books. You use the MAPI logon function to log clients on to the messaging system and authenticate their identity to the messaging system. You can

create custom dialog boxes for the logon process, or you can use the standard MAPI logon dialog box.

Logging on generates a session handle that applications use to interact with the MAPI environment. A session handle is a pointer to a session object, which supports the **IMAPISession** interface. You use **IMAPISession** methods to manage and find objects in the MAPI environment.

An example is **IMAPISession::OpenAddressBook**, which opens the address book. It is possible for a single client to acquire handles to two different session objects and open two different message stores. In this way, clients can copy data between message stores in different environments.

After logon and retrieval of a handle to a session object, the application can access message stores. You use the **IMAPISession::GetMsgStoresTable** method to get information about available message stores. The table that this method returns contains row and column information. The rows list message stores. The columns list information about the message stores, such as entry ID (that is, unique reference), the name of the provider that handles the message store and whether the message store is the default.

The **IMAPITable** interface is used to retrieve information from the message stores table. For example, **IMAPITable::SetColumns** specifies a column, and **IMAPITable::QueryRows** returns the data in a specified number of rows, starting with the current column. To actually open a message store, you pass its entry ID to the **IMAPISession::OpenMsgStore** method. Once a message store is open, you use the **IMAPIMsgStore** interface to browse its folder hierarchy.

You create and manage folders with



The MAPI programming architecture includes the session, the message store, and the address book



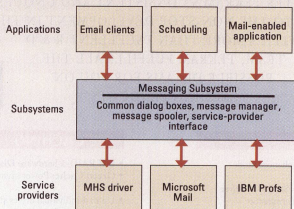
available. A unified log-on is supported, so you can access multiple workgroups with a single log-on.

Spooler and transport providers

The spooler handles the sending and receiving of messages between applications and the back-end messaging services in the same way a print spooler routes jobs to each printer. The spooler interfaces with messaging-transport service providers, which are user-installable drivers that create the connection to the underlying messaging services. The spooler directs in-bound messages to message stores and manages undeliverable messages.

If a messaging service is temporarily unavailable, the spooler automatically sends the message when the messaging service becomes available. The spooler performs its operations in the background, when foreground applications are idle, to minimize performance loss. Transport providers are implemented as user-installable drivers, which are installed for each

Windows messaging system



The MAPI subsystem resides in Chicago. It provides the link between applications and back-end messaging services with a functional layer called the messaging subsystem. MAPI provides an additional number of Windows APIs that allow applications to use messaging services, including common dialog boxes, message management, and the ability to exchange messages with any back-end MAPI-compliant messaging service. Drivers are installed for each back-end messaging service you need to access.

messaging service that you or applications need.

In some cases, an underlying message system might not be able to accurately represent and deliver the contents of a MAPI message. In this case the MAPITNEF

(Transport Neutral Encapsulation Format) is used to pass both text and binary message data over the system. Any unsupported MAPI properties are placed in a binary file that is attached to the message. The receiving system then decodes and restores the MAPI properties. According to Chris Williams, product manager at Microsoft, TNEF allows message transmission at "full fidelity" with no degradation, even if the message transport does not directly support MAPI capabilities.

The MAPI message store

Extended MAPI uses message stores for all its operations. A message store is a hierarchical storage system in which folders can contain other folders and messages can be stored at any level in the hierarchy. Every message store has at least one folder that is called the root folder. Your local message store, and message stores that you may access on the network or from remote systems, are stored in collections. As you create messages, they are

the **IFolder** interface. The functions of the interface become available when you create or open a folder object. For example, **IFolder::GetContentsTable** returns a pointer to a table of summary information. **IFolder::GetHierarchyTable** returns a table object with information about the child folders of the current folder. There are also functions for performing management on folder objects and messages in folders and for reading or setting search criteria.

Address information

MAPI address books provide message address information and hide the differences in addressing schemes used by the different back-end messaging services. Programs can access address books without user intervention, or you give users access through the common dialog boxes provided with MAPI. The address-book dialog boxes let users pick "human-readable" names from a list, which are converted in the background to internally used messaging addresses. Address books, like MAPI message stores, are hierarchical objects. Objects in the address book (that is, containers, mail users, and

distribution lists) are accessed with unique entry IDs.

You open an address book by calling the **OpenAddressBook** method on the session object. A pointer to an address book object is returned that supports **IAddrBook**, which is a high-level interface to the address book. It supports operations like displaying the address-book dialog box, opening containers in the address book, and resolving friendly names with email names. You can view the internal organisation and structure of an open address book with **IABContainer::GetHierarchyTable**. This returns a table that you can examine with the **IMAPITable** interface. MAPI provides other interfaces for creating containers in address books and adding recipients in the container.

Messages, attachments, and other MAPI objects are principally composed of data called properties. A property is a data structure that contains a unique identifier, information about the data type, and the value of the data. Applications use the **IMAPIProp** interface to read, write, and modify object properties.

Common MAPI Properties include the subject line of a message, user names, and

the body of an attachment. Properties are values read by the recipient or the transport that handles the delivery of the message. Every property accessed by object methods has a unique name. For example, every **IMAPI** object has a property called **PR_OBJECT_TYPE** that describes the type of object it is.

Finally, messages are created in folders with **IFolder::CreateMessage**. This returns a pointer to a message object. Message properties are set using **IMAPIProp::SetProps**. Message properties include the icon associated with the message, text that appears in the message's Subject field, and the text that makes up the body of the message.

So that the user can address the message, **IAddrBook::Address** is called which returns a list of recipients that the user selected from the address-book dialog box. A pointer to this recipient list is then passed to the message object using **IMessage::ModifyRecipients**. When the message is complete, it is sent with **IMessage::SubmitMessage**. This saves all changes and marks the message for sending. At this point, the underlying messaging system takes over and delivers the message.

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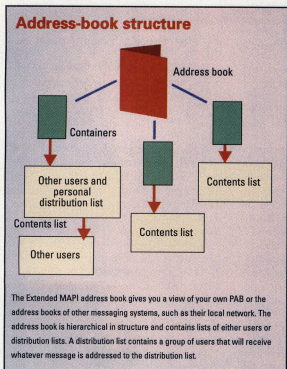


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placed in the message store with messages from other users. You can place copies of a single message in multiple folders, and each copy becomes an individually modifiable message. A deleted-mail folder holds messages that are marked for deletion. During a typical session, you can copy and move messages from one message store to another. Before disconnecting from a network or remote system, you can copy or move messages into their local store for later use.

Messages can have attachments (for example, files and OLE objects). If you receive a message with an OLE object attachment such as an Excel spreadsheet, you can edit the object by activating it in the message. That message and object can be stored for later viewing or be forwarded to the recipient or another user. Messages are objects with properties that hold information such as the time the message was sent and the name of the recipient. The values of these properties are accessible by MAPI client or server applications.

Folder operations that are available in Extended MAPI include the ability of clients to examine the folder hierarchy, examine folder messages by subject or other property, search the folder hierarchy for specific information or properties, and manipulate the structure of the message store. The message store has search features that help you locate messages in folders. You can search based on the properties of message objects (for example, user, subject, time, date, and custom properties).

A MAPI notification engine goes

beyond simple polling processes that check for messages at specified time intervals. It lets clients specify various system events. When those events occur, the MAPI subsystem notifies messaging applications or service providers to take appropriate actions.

MAPI address-book providers

The MAPI address book provides message address information for all possible recipients. A typical desktop will contain your PAB (Personal Address Book) and optional address books for network or remote systems. Although a service provider typically utilizes its own addressing method, the MAPI address book hides the addressing differences by providing a unified addressing scheme for the client.

You install a driver for each service provider to which you need access. Dialog boxes let you pick 'human readable' names from a list. These names are converted in the background to internally used messaging addresses.

The structure of the address book itself is organized into containers that hold recipients and recipient lists. Containers are like folders that hold other containers or recipients. They are used for organizational purposes. Distribution lists indicate recipients that are referred to by a single name. While a typical address book might use a single container to hold its list of recipients, multiple containers or hierarchies of containers are also possible. For example, an address book might have Local User and Remote User containers. Each different network messaging system will have containers that appear in the top-level address book.

You can customise a PAB, for example, to form a collection of address-book entries from other address books. If you frequently send messages to network or remote systems, you can copy the addresses to the PAB. This is not only convenient, it also places the address locally, in case the system holding a remote address book goes down. A local PAB also reduces LAN traffic.

Chicago's InfoCenter

MAPI's messaging system independence is most apparent when working with Chicago's InfoCenter. It provides a single

place where you can read and send email, send and receive faxes, access workgroup servers, move messages and documents, and organise all types of information. It presents a single user interface, while providing connections to a diversity of information services (for example, the Internet, CompuServe, and MCI Mail). At this writing, however, it is not clear which services the InfoCenter will support in its first release.

The InfoCenter is a 'viewer' that works as a client to any email or information system when the appropriate MAPI drivers are available. "MAPI will just call the appropriate service provider," says Isocor's Knight. "I can send the same message to 10 people, even if each one is on a different system. One can be voice only, and it would do a text-to-speech conversion. Then it could do a fax for the next guy, MCI for the next person, and maybe France Telecom for the next."

Any information or messaging service provider can develop a MAPI driver. Chicago users will be able to access those services through the MAPI-compliant InfoCenter. According to Microsoft, over 60 vendors are creating MAPI drivers for their email systems, voicemail applications, workgroup applications, and information systems.

To work with the system, you log on to Chicago and choose View Inbox or Compose New Message from the start menu. You can compose OLE 2.0 objects. It doesn't matter if the underlying message system doesn't understand these formats, because MAPI will automatically encapsulate the special information into a binary file that is readable by a MAPI-compliant recipient.

What about VIM and X.400?

Although MAPI appears to have gained industry wide acceptance, other companies have developed VIM, which is a cross-platform API. Like Extended MAPI, it simplifies the creation of messaging reliant and mail-enabled applications by providing message-store, transport, and directory functions. Developers need only write their mail-enabled or messaging-reliant applications to one interface.

According to Ed Owens, director of technology relations at Lotus's cc:Mail division and chairman of XAPIA, over 300 software developers have obtained the new VIM toolkit. A number of applications are already on the market that use it. "In theory, VIM is independent of both the message transport and environment on which you run it, but in reality," says Owens, "the current implementation of VIM is only on Lotus messaging products like Notes and cc:Mail."

Owens notes that Lotus is developing a VIM-over-MAPI layer, so people writing to VIM will be able to run in a MAPI environment. He says that future Lotus products will provide a service-provider interface to tack up under MAPI. Third parties will have a voice in which way to go.

While the VIM camp accuses MAPI of running only under Windows, Knight claims it's only a temporary problem. Isocor is developing MAPI for Unix and similar operating systems. "We do not have customers clamouring for VIM," he says. "MAPI is already a worldwide phenomenon because it's exactly what users have been looking for: an open client/server messaging architecture that preserves the investment in backbone technology."

"One of the problems with VIM is that Lotus has stated that it is implementing VIM on the server side," says Janie Chang, director of product marketing at Infonet Software Solutions, a provider of X.400 and X.500 messaging systems. "What that means is that they want people to write applications that run over their transport, which is the cc:Mail and Lotus Notes transport."

There are three important standards for implementing back-end messaging services and backbones: the international X.400 standard, the Internet's SMTP, and Novell's MHS. A backbone minimises the number of gateways required by clients to access a message system and provides centralised management. X.400 and SMTP are public standards. MHS is a proprietary standard. X.400 is a specification defined by the International Telecommunications Union that outlines how to build interoperable messaging systems. SMTP is used on the Internet and Unix networks as a store-and-forward messaging system.

While X.400 is an industry-accepted standard, SMTP has gained more popularity as a de facto standard for use with the Internet. However, Microsoft and the others are developing X.400 servers that MAPI clients can plug into. Microsoft's Exchange Server implements a client/server architecture that is based on the X.400 messaging stores, which are facilities for housing data and information in the form of messages, documents, and folders.

MAPI's inside track

As part of Chicago and with the support of most messaging-system vendors, MAPI has the inside track to become the solution of choice for implementing enterprise-wide messaging systems.

"Architecturally, MAPI makes the most sense," says Chang. "It's probably the closest thing we have seen from a PC software vendor that actually allows the plug-and-play concept of messaging." ▲

CMC and simple MPI functions

Much similarity exists between CMC and Simple MAPI functions. Microsoft recommends using Simple MAPI to maintain backward compatibility with existing applications that have been written using Simple MAPI. CMC should be used by developers wanting cross-platform support.

CMC function	MAPI function	Description
CMC_Logon	MAPILogon	Establishes a session with the messaging service.
CMC_Logoff	MAPILogoff	Terminates a session with the messaging service. Frees the memory allocated by the messaging service.
CMC_Free	MAPIFree	Frees the memory allocated by the messaging service.
CMC_Send	MAPISendMail	Sends a standard mail message. Messages can be sent without any user interaction or can be prompted via a common user interface.
CMC_SendDocuments	MAPISendDocuments	Sends a standard mail message. This call always prompts with a dialog box for the recipient's name and other sending options. It is primarily intended for use with a scripting language such as a spreadsheet macro.
CMC_List	MAPIFindNext	Lists information about messages meeting specific criteria.
CMC_Read	MAPIReadMail	Reads a specified mail message.
CMC_ActOn	MAPISaveMail, MAPIDeleteMail	Saves or deletes a specified mail message.
CMC_LookUp	MAPIAddress, MAPIDetails, MAPIResolveName	Handles addressing chores, such as addresses, looking up addresses, and resolving friendly names with email names.
CMC_QueryConfiguration		Determines information about the installed CMC service.

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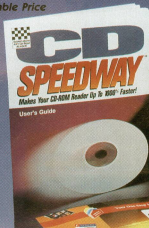
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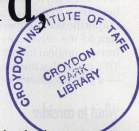
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Are a new routing standard, lower cost, and better scalability enough?



Fax servers: Moving closer to the paperless office.

BY O. RYAN TABIBIAN

The paperless office might be a distant possibility, but paperless electronic faxing is a reality today. Fax servers offer reliable faxing to and from your networked desktop PC, with many advanced features not found on standard fax machines. Before you get rid of your fax machine, however, keep in mind that the fax server market is still in its infancy and has yet to offer a reliable and affordable method to route incoming faxes automatically.

In our quest to shed light on the fax server market, we reviewed four products: Traffic Software's Object Fax Advanced Version 3.01, Cheyenne's FaxServe for NetWare, SofNet's FaxWorks OS/2 LAN Version 1.39 and TRIO's Datafax for Networks Version 4.01e. Bitware, Australian distributor for Delrina WinFax Pro for Networks, was awaiting shipment of WinFax Pro for Networks Version 4.

FaxWorks Pro LAN for OS/2 will replace FaxWorks 1.39 by the end of this year, adding drag and drop and 96 line support. Intel was also approached to provide us with an evaluation copy of its SatisFAXtion software. The company has made the decision to cease production of the SatisFAXtion line. Staff at Intel's Sydney office told APC that Intel is developing a new generation of devices to be announced by the end of 1994.

While this decision may be a tactical move by Intel to develop its potential in the high performance communication market, it has left Cheyenne's FaxServe Australian distributor, Com Tech, temporarily out of the market as the Intel SatisFAXtion board is the only Austel-approved

faxmodem that Cheyenne has certified. Com Tech is now awaiting Cheyenne's ratification of a number of Austel-approved fax cards from manufacturers including Banksia, Netcomm and Hayes.

The fax servers reviewed were selected on a number of criteria. Since nearly every fax server uses some form of inbound routing to manage faxes across the LAN, these products should offer direct inward dialing (DID), the most effective method today. The ability to send and receive faxes across multiple lines is also a must, particularly if you send to

multiple sites. Such a load can tax most clients, not to mention the security issues associated with faxes.

Each product here offers a unique set of features. Leading the way with its flexibility and expandability are Traffic Software's Object Fax and Trio's Datafax for Networks, the winners of our Network Edition Editor's Choice.

How the fax goes

There are two basic types of computer-based faxing software: desktop and network. Desktop fax software is popular for faxing from your PC. Standalone fax software is not as efficient as the use of fax servers for groups of users, since it requires each user's PC to have a phone line and fax modem. Fax servers, on the other hand, let you share these fax boards and phone lines among several users. With fax servers you can send broadcast faxes, queue and schedule faxes on the server, and receive faxes directly at your PC. You can also attach ASCII files to be sent to other fax servers, a process each of these products supports.

Along with server code, fax servers use

Coming soon: WinFax Pro

WinFax Pro for Networks Version 4.0, unavailable at the time of this review, is due for release by November.

According to information sent to us from the product's Australian distributors, Bitware Pty Ltd, the new version will offer advanced features for sending, receiving and managing faxes.

Automatic inbound routing by DID, DTMF and CSID will be possible and Microsoft Mail's MAPI, cc:Mail's VIM as well as MHS mail will be supported. Server based queuing and scheduling of faxes will be possible and it will be able to convert received faxes to text with the product's OCR capabilities. A new fax viewer will be able to filter out 'random noise' on poor quality faxes as well as

export faxes to a number of graphic formats including TIFF, PCX and BMP.

One feature destined for popularity is Delrina's incorporation of PIM and database phonebook support. Entries in ACT for Windows, Polaris PackRat and a number of other PIMS can be read directly allowing centralised contact management.

WinFax Pro can be configured as a dedicated fax server or be left in the background on a non-dedicated machine. The product supports both IPX and NetBIOS and can be used with over 600 Class 1 and Class 2 faxmodems.

APC will be reviewing the new information in December First Looks. For more information contact the product's Australian distributor, Bitware Pty Ltd, on (03) 532 2274.

client software to send faxes. Each of these products offers a standalone package to send and receive faxes. Each lets you send faxes from any application by allowing the fax server to emulate a printer and then output the fax. In either case, the file is then sent to the server where it is converted from its original format (text or visual) to a TIFF image that the fax server can transmit — a process known as rasterisation.

What to consider

How do you decide which fax server is best? First, consider the amount of faxing you will be doing and the level of sending and receiving functionality you expect. Here you need to think about broadcasting, queuing, rasterisation, and scalability.

When you start sending faxes to multiple recipients (called broadcasting) other features become even more important. In our testing we found broadcasting was supported equally by all of the products. Queuing, a function supported by all of these fax servers, lets you reduce fax transmission costs by storing and scheduling your faxes on the server so they can be sent during off-peak hours.

If you embark on large-scale faxing, scalability — the maximum number of phone lines supported — becomes critical. Multiline support for more than 24 lines is offered by all of these products. To support more than four lines you will need to invest in a fax board, such as GammaLink's GammaFax, that integrates multiple fax



■ Object Fax Advanced, Version 3.01

■ Trio Datafax 4.01e

There were a number of distinguishing factors in these products which qualified them for Editor's Choice. Each offers a comprehensive set of features along with an extremely flexible design, allowing them to accommodate a variety of environments — from a small office to a multinational enterprise. This fact, along with intuitive installation programs, support for inbound routing methods, and feature rich, easy-to-use client software, make these products excellent for all your faxing needs.

modems on a single board.

Rasterisation is particularly important if you send many faxes, since your workstation will be busy during the rasterising process for each fax.

On the other hand, if receiving faxes is most important, then you must decide on a viable and cost-effective means of inbound routing. Currently there is only one reliable automated method — direct inward dialing (DID). This is expensive since it requires you to install a separate telephone exten-

SofNet's FaxWorks OS/2 LAN offers excellent client software and one of the best graphical user interfaces. On the server side, FaxWorks is the only product to offer an OS/2 solution, taking advantage of a 32-bit multithreaded operating system. The product, unfortunately, is difficult to install.

Cheyenne's FaxServe offers a NetWare loadable fax server module. It is robust, not too difficult to install and offers the advantage of eliminating unnecessary hardware.

sion for each user, but other methods such as call subscriber identification (CSID), dual tone multifrequency (DTMF), and optical character recognition (OCR) are unreliable and inconvenient methods of routing. One promising technology is T.30, but unfortunately only one product in our round-up, Traffic's Object Fax, supports this feature (see "Glossary: Inbound routing methods"). Email support is currently limited: none of the products offer automated inbound routing of faxes to email.

Price needs to be factored into the equation, but not merely the list price. Over time the cost of phone calls, maintenance, and support outweighs any hardware cost. What you do need to consider is the entry cost: just how much you'll need to spend to get into faxing. Currently there are two types of fax servers: software-based and hardware-based. Software-based servers require a dedicated PC, network adaptor, and fax boards, as well as some technical savvy for installation and configuration. The initial cost of a fax server can run upwards of \$10,000 including the cost of software, hardware, DID, and phone installation.

These products tend to carry their own installation problems, particularly when you're configuring multiple fax boards or adding users to the server.

There are also hardware-based alternatives such as that from Castelle (contact ComTech on 02 317 3088) which integrate all of these components in one box, providing a complete plug-and-play solution. Hardware-based products typically cost more than their software-based counterparts, but if ease of installation is important, you might want to consider spending the extra money.

Suitability to task: Fax servers

Send: The majority of your desktop faxing involves sending faxes. It is important that the client software offers an easy-to-use interface, printer driver features that let you fax from applications, and confirmations for both successful and failed transmission. The ability to attach ASCII files is also important.

Receive: Methods of receiving faxes are integral to a fax server. The most important thing to look for is the type of inbound routing offered. There is a variety of methods to choose from, including direct inward dialing (DID), dual tone multifrequency (DTMF), optical character recognition (OCR), and T.30. If none of these inbound routing methods seems feasible then you will need to rely on the administrator to route faxes manually. In this case, security becomes increasingly important. Also, look for Vendor Independent

Messaging (VIM) and Microsoft's Messaging API (MAPI) support and the ability to forward faxes to email.

Management: Solid management is the key to any networked device, including fax servers. We looked for reporting capabilities, such as the percentage of time that the fax server is busy, and live monitoring of the fax server's status. When problems arise, the ability to send alarms to the fax manager is vital.

Installation: Here we evaluated the ease of installation as well as the technical prowess required for installation. While installation might not be the most important factor in choosing a fax server, it does warrant attention. Successful installation of a software-based fax server requires that its hardware counterparts, such as the fax modem, LAN adaptor, and the software, all work in perfect harmony. Well-organised and detailed documentation is also a plus.

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SUITABILITY TO TASK	
Send	POOR
Receive	FAIR
Management	GOOD
Installation	EXCELLENT

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1 1 4 2 3 7

3-View
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Aug 18, 10:37:00
Bridge Port Analysis - (NET - Port 2)
0 days, 82:52:11.3
Rx Broadcast Pkts. %
Tx Pkts./sec
Av. Network I/O %
Table Missed %
Good Packets/sec
Av. Rx Pkts. size
Tx Pkts. size
Port Analysis: (NET) - 0:01
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Bridge Port Analysis - (NET - Port 2)
0 days, 82:52:11.3
Rx Broadcast Pkts. %
Tx Pkts./sec
Av. Network I/O %
Table Missed %
Good Packets/sec
Av. Rx Pkts. size
Tx Pkts. size
Port Analysis: (NET) - 0:01
0 days, 82:52:11.3
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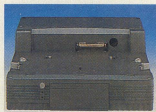
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- 486DX2-50/66 Mhz
- 486DX4-100 Mhz

BIOS

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Management is another factor to consider. Since faxing is mission-critical to most companies, features like server and queue status, reporting capabilities such as detailed cost-analysis reports, and alarms are recommended.

Paperless faxing cannot realise its true potential until a cost-effective inbound routing method such as T.30 is adopted by the industry. In the meantime, you should certainly take advantage of the wealth of features that a fax server has to offer.

And hold on to that old fax machine of yours. It's not going away anytime soon.

Cheyenne FaxServe Version 2

Cheyenne's FaxServe is an NLM-based client/server fax application which eliminates the need for a dedicated fax server box.

Unlike Trio's Datafax, which features

GLOSSARY:

Inbound routing methods

CSID: Call subscriber identification. A limited but popular inbound routing method. Since most machines transmit a CSID number at each connection, a particular number can be assigned to a specific person.

DID: Direct inward dialing. An inbound routing method that assigns an individual extension to each person. DID requires the purchase of trunk numbers from the phone company, which can then be assigned to users. The sender transmits each fax to the appropriate extension.

DTMF: Dual tone multifrequency. An inbound routing method that requires the sender to enter a specific code on the fax machine after the normal handshake. Once the code is entered, the fax machine on the other end can decipher the code as a handshake.

OCR: Optical character recognition. A technology that translates images of printed characters into text. Using OCR, the server converts the fax image to text, reads the name of the recipient, and routes the fax appropriately. Since OCR is still not very reliable, it is one of the least used methods of inbound routing.

T.30: An inbound routing method that, like the DTMF method, requires a code to be entered by the sender after dialing. With T.30, the code is a number followed by the pound sign.

one-step installation, FaxServe's installation is broken into three separate parts. Following the installation manuals closely is wise — the process is far from intuitive. Familiarity with both NetWare and server hardware is certainly a useful, if not necessary, requirement.

Initial installation involves installing the NLMs from a workstation connected to the server destined to run the fax software. The NLMs are then loaded to the 'host server' after which the fax modem support software must be added and configured. Rather than integrate the installation into a

single process, an application on each installation disk must be run in turn. The card configuration software allows a wide cross section of devices to be chosen from Class 1, 2 and CAS devices to specific cards such as the Intel Net SatisFAXtion. The server is launched from the console by running a NetWare Command File (NCF) that loads the required NLMs in the correct order. Configuration programs will cause the NLMs to automatically unload.

Client software is then installed on the server; client installation is quick and simple, requiring only one file to be run

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Object Fax offers a great overall fax server solution. Potential buyers should, however, consider its problematic user installation before purchasing it.

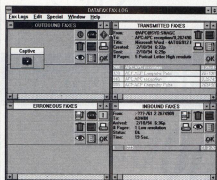
O. Ryan Tabibian

Trio Datafax Version 4.01e

Trio Information Systems Datafax for Networks client/server fax software is simple to install, easy-to-use and feature rich.

Datafax's install utility loads both the fax server and fax client configuration software on the file server and configures the fax server box. The server can be either a dedicated Windows/DOS machine or a non-dedicated Windows box.

The initial installation process loads the client configuration software onto the net-



work file server. Running up a Windows client takes barely a minute; it is a one-step operation and adds fax support as well as macros for popular word processing packages AmiPro and Word. One real advantage of this installation is that it allows the server to be quickly and easily moved about to different machines with minimal fuss.

Sending faxes is a breeze — either set the fax driver as a print queue and print directly to it from any Windows application or use the floating toolbar to capture and fax at the touch of a button. Before transmission, users can select people or groups from phone books, prioritise as well as schedule, preview and merge faxes.

Trio Datafax Version 4.01e	
SUITABILITY TO TASK	
Send	EXCELLENT
Receive	GOOD
Management	GOOD
Installation	GOOD

A smarticon utility, known as capture, provides instant access to fax support. It allows clipboard contents — including a part screen capture — to be faxed. It supports quick notes, has a document find utility and, most importantly allows

files to be drag 'n' dropped from the File Manager (certain graphic and text files only).

The Datafax Log viewer allows a job's status to be quickly determined. The utility displays outbound, transmitted, inbound and erroneous jobs. When a job has completed, the sender is notified. If an historical record is desired the server can be set to save faxes on transmission, but deletion on transmission saves disk space.

DTMF, DID and OCR automatic inbound routing methods are supported by

the package, unlike FaxServe, DTMF numbers, are not automatically assigned.

The software is easily managed through the Datafax FaxOffice. This utility gives the administrator the ability to change server configuration, user rights and information, view logs, edit phone books, prepare cover sheets and create call reports.

Datafax's advantage is its ease of installation and use. While numerous options are given to both the user and administrator, at no one time does it overwhelm basic procedures. ▲

Ben Gerholt

Product	FaxServe for NetWare Version 2	FaxWorks OS/2 LAN Version 1.39	Object FAX Advanced Version 3.01	Datafax for Networks Version 4.01e
Distributor	Com Tech (02) 317 3088	Digital Solutions 1-800-804 635	Espektor Imports (03) 737 4036	PCWare (02) 252 3546
Cost	Users: 5 — \$620/ 25 — \$1095/ 50 — \$1415/100 — \$1890/250 — \$2680/	10 user \$1250 100 user \$3516	5 user/4 line \$1985	5 user 1 line — \$749/first additional line — \$52
GENERAL				
Server platform	NetWare	OS/2	DOS/Windows	DOS/Windows
Works with dedicated/non-dedicated PC	n/a	n/y	y/n	y/y
Maximum number of fax modems supported	32	32	32	24
Fax classes supported	1/2/CAS	1/2	1/2/CAS	1/2
Supports reconnection on client	y	y	y	y
Supports queuing on server	y	y	y	y
SEND AND RECEIVE FEATURES				
Private and public address books	y	y	y	y
Delete	y	y	y	y
Forward	y	y	y	y
Notify	y	y	y	y
Store in message-in-box	y	y	y	y
View entire fax	y	y	y	y
INBOUND ROUTING SUPPORTED				
CSID	n	n	y	n
DID	y	y	y	y
DTMF	y	y	y	y
OCR	n	n	y	y
T.30	n	n	y	n
CLIENT OPERATING SYSTEMS SUPPORTED				
DOS	y	y	y	y
MS Windows Version 3.1	y	y	y	y
OS/2 Version 2.1	n	y	n	n
Macintosh	n	n	n	n
NOS SUPPORTED				
NetWare 3.x/4.x	y/y	y/n	y/y	y/y
MS Windows for Workgroups	n	y	y	y
MS Windows NT	n	y	y	y
OS/2 LAN Server	n	y	y	y
VINES	n	y	y	y
SEND TRANSPORT MECHANISMS SUPPORTED BY CLIENT				
Email	y	n	y	y
Print driver	y	y	y	y
Vendor provided application	y	y	y	y
Receive transport mechanisms supported by client				
Email	y	n	y (through manual routing)	y
Vendor provided application	y	y	y	y

"The next generation of monitors has arrived....."

(PCWEEK U.S. October 1993)



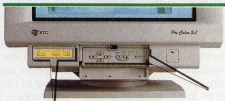
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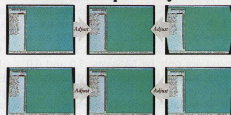
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The smart digital control offers users 15 adjustable functions; Brightness, Contrast, H-size, V-size, H-shift, V-pincushion, Trapezoid, Rotation, Hi-color R.G.B. and Lo-Color R.G.B. Users may adjust any parameters they want according to their display card.

Rotation Adjustment



Pincushion and Trapezoid Adjustment



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CorStream: the perfect union of LANtastic and NetWare?

BY STEVE RIGNEY AND JEFFREY BAHER

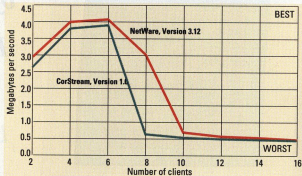
Looking to improve the performance of your LANtastic network? Artisoft's new CorStream Version 1.0 can help: it's a 32-bit dedicated server that runs as an NLM on top of NetWare 4.01, bringing the power of NetWare to LANtastic for larger, more robust LANtastic networks. Although LANtastic 6.0 clients can already attach to NetWare 3.12, CorStream is far more effective at maintaining LANtastic's ease of use and administration. Of course, whether you go with CorStream or NetWare 3.12, you're going to suffer through a lengthy installation.

Although LANtastic is typically considered a workgroup solution, we know of several LANtastic network sites supporting well over 100 clients. These are the sites that stand to benefit most from CorStream. In our experience, LANtastic networks typically run out of gas when there are about 10 active clients and no dedicated server. With a dedicated server, the network can usually support between 15 and 20 active clients, depending of course on the applications that are running.

CorStream (\$1641 with a five-user copy of LANtastic 6.0) provides the boost these networks need. It runs as an NLM on a NetWare 4.01 server, which can be accessed not only by LANtastic 5.0 and 6.0 clients, but also by NetWare 4.01 clients. A streamlined runtime version of NetWare 4.01 is included with CorStream, along with a two-user, full-featured version. The runtime version of NetWare 4.01 doesn't provide the enterprise-wide features that distinguish it from NetWare 3.x, such as NetWare Domain Service (NDS) support.

The CorStream NLM works by intercepting and converting LANtastic packets into NetWare service requests. So NetWare drives and printers become available to LANtastic clients, but the NetWare 4.01 server handles all the requests to access them. Because of this conversion process, CorStream cannot perform quite as fast as a native NetWare 4.01 server. But we didn't notice any significant difference during our tests.

Before CorStream, you could set up a dedicated server with LANtastic in one of two ways: configure a LANtastic client that no-one actually uses, which will provide



significant performance gains but still limits you to a 16-bit DOS server, or attach a LANtastic 6.0 workgroup to a NetWare 3.x network and take full advantage of LANtastic's universal client and NetWare's 32-bit OS. Integrating LANtastic 6.0 with NetWare 3.12 can lead to significant improvements in overall network performance—better performance, in fact, than with CorStream. But, CorStream brings more than just a performance boost to LANtastic. Most importantly, CorStream maintains LANtastic's ease of use and simple administration while bringing most of NetWare 4.01's basic features, including disk compression, disk mirroring, and disk duplexing, to the LANtastic network. This is all done without the need for multiple protocol stacks on each client and without users logging on to multiple security systems (both of which are required to integrate LANtastic 6.0 with NetWare 3.12). Another disadvantage of the NetWare 3.12 solution is that it requires an additional product, Artisoft's LANtastic for NetWare Version 5.0 to support LANtastic 6.0 clients.

Another point in CorStream's favour: users can map drives via LANtastic's familiar NET utility, while the same action under NetWare 3.12 would require them to learn complicated command-line structures. Using NetWare 3.12 would also require NetWare login scripts, printer definition files, and other administrative headaches for each client.

LANtastic by itself is a breeze to install, but CorStream is definitely not. It took us several hours to get the runtime version of NetWare 4.01 loaded and configured on the server,

even though it is only eight disks. The CorStream NLM, which is only one disk, loaded quickly but required us to reconfigure one of our LANtastic clients as a NetWare client. On the other hand, the LANtastic client software was simple and straightforward; it took only a few minutes per client to install.

We tested CorStream on a 16-client network and compared its features and performance to those of NetWare 3.12, using the I/O Throughput test in NetBench 2.10.

Since CorStream runs on top of NetWare 4.01, we expected to see performance numbers slightly lower than those for NetWare 3.12, based on results we've seen in previous tests. Our expectations proved accurate: NetWare 3.12 outperformed CorStream across the board, though not by any great stretch. Both peaked at around four megabits per second total throughput with six clients, then declined sharply as more clients were added, though CorStream's scores bottomed out sooner.

Since both products deliver similar performance and cost roughly the same, the choice between CorStream and NetWare 3.12 comes down to ease of use. If ease of use is absolutely vital to your organisation, as it is to many LANtastic users, then CorStream is the obvious choice.

Distributor: Merisel, Digital Solutions

Phone: (02) 880 2688, (07) 883 1851

Price: For five users, \$1356; with a five-user version of LANtastic 6.0, \$1641.

In short: Artisoft's CorStream augments the ease of use of LANtastic 5.0 and 6.0 networks with the power of a NetWare 4.01 dedicated server. It runs as an NLM and provides solid performance along with most of NetWare 4.01's basic features to LANtastic clients. Integrating LANtastic 6.0 with NetWare 3.12 can deliver better overall performance at a slightly lower cost, but it needs an add-on to support LANtastic 5.0 clients and can impose considerable administrative burdens on LANtastic users.

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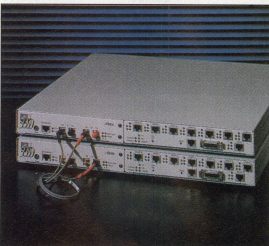
NEW AND IMPROVED

Retix introduces remote router and drops prices

Retix has released the ROUTERXchange 7000 series of Ethernet to WAN routers. The new router family, aimed at the remote office market, currently includes two products: the \$2995 RX7102 that includes one Ethernet and one WAN port, and the \$3595 RX7103 with two WAN ports.

IP and IPX routing software and WAN interface and cables are included with the routers. The products have flash memory, are SNMP-compatible and can simultaneously route IP and IPX. They can also bridge all protocols including DECnet, XNS, and AppleTalk.

Retix has also reduced the price on the SWITCHStak 5000 range. The SWITCHStak 5000 uses store-and-forward technology to eliminate Ethernet packet error distribution. The eight-port SWITCHStak



Cheaper: The Retix SWITCHStak 5000

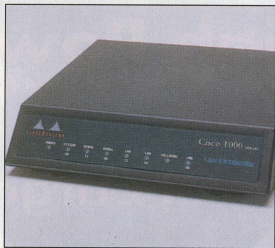
supports up to 3072 end-stations, SNMP, VLAN configuration and has an optional redundant power supply. For more information on these products contact Retix Australia on (02) 369 1333.

NEW

Cisco's enterprising launch

Kate Geberano SLIPped her way into the internetworking world to launch Cisco's Access III product range. The launch of the new range of internetworking devices was held at Sydney's Overseas Passenger Terminal in front of a crowd of over a thousand networkers, resellers and journalists.

Cisco, which claims to have 57 per cent of the world router market, has added the



The Cisco 1000: cost effective remote access for small offices

new products to allow organisations to extend their enterprise network into smaller branch and single user sites. The range includes the Cisco 1000 LAN extender — the smallest of standalone routers available from Cisco — which provides remote Ethernet LANs with a WAN connection running up to 2Mbps on leased lines.

A number of models based around Cisco's 2500 series have been released in the new line-up. Notable inclusions are the Cisco Hublet — a combination router and hub — and the 2500 series access servers. These provide remote access routing to connect to the corporate network and remote node access for multiple connections to single users and branch offices.

The AccessPro Server Card, the first PC card with full router capability, is included in the new range. Potentially an ideal server-router combination for remote sites, the ISA-based card hives power off the PC through the bus but does utilise the PC's CPU. This leaves the router unaffected by soft boots. The card can be configured through the keyboard and monitor of the PC — a separate console is not required.

For more information on this extensive range contact Cisco on (02) 957 4944.

152G of storage on Exabyte's DAT tape library

The EXB-218 4mm DAT tape library, from Exabyte Solutions, can hold up to 18 4mm tapes

and be configured with either one or two 3.5in 4mm DDS-1 or DDS-2 DAT drives. 38G of native storage or 76G of compressed storage is possible from two DDS-1 drives. The dual DDS-2 drive library will support 76G native or 152G of compressed data.

Unlike tape autochangers that load tapes sequentially, the library uses random access robotics that improves tape reload times. A fixed cleaning cartridge location is included that can also be used to hold another data tape. Purchasers can opt to add Exabyte's barcode reader to simplify tape management.

According to Exabyte Solutions general manager Bruce Carmen, the library has the potential to automate operations — when connected to the appropriate software — including hierarchical storage management, unattended backup and restores, scheduled archiving, image storage and remote vaulting.

"While tape libraries are associated with high capacities, the real productivity gains are realised through automating storage management," Mr Carmen said.

The unit, which can be rack mounted or standalone, is due for shipping in November. Exabyte estimates it will retail for under \$20,000.

Exabyte has also announced the release of a 7G native (14G compressed) capacity 8mm tape drive. The EXB-8505XL drive will use Exabyte 160m XL 8mm media — specifically designed for use in the drive — to achieve this capacity. The drive is fully compatible with other 8mm helical tapes and features a compressed transfer rate of 1M/sec. The EXB-8505XL



The EXB-218 tape library incorporates random access robotics and dual DDS-2 DAT drives to provide 152G of storage on 18 tapes

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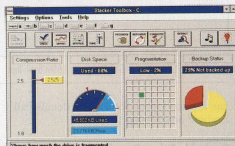


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run, but DoubleSpace demands 37 kilobytes. Stacker 4.0 lets you tune your speed and compression ratio - you get no control with DoubleSpace.

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Upgrading will save users of MSDOS 6.x, PC DOS 6.x, Novell DOS 7.0 and Stacker 2.0-3.1 up to 60% on Stacker 4.0's recommended price.

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Stacker 4.0's advanced compression guarantees the most disk space possible. If you are not completely satisfied with Stacker's performance, just return your upgrade to Stac within 60 days of purchase for a prompt refund.

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You'll wait many years (probably forever!) for any other product to match this performance. And that's why an upgrade to Stacker makes sense *today* - you can be sure our standard is here to stay.

Just ask Compaq, IBM and Novell, who recently made Stacker 4.0 their first choice!

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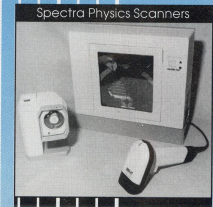
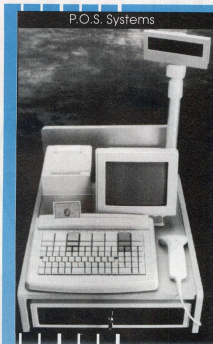
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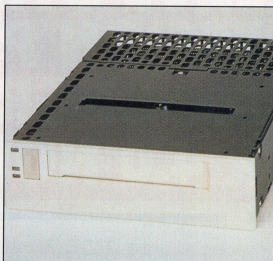
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The EXB-8505 offers up to 146 of storage per 160m 8mm tape

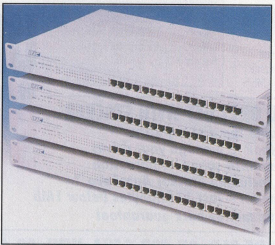
has a price tag of \$6825. For details call Exabyte on (02) 906 1155.

Stackable Token Ring hub

INC Manufacturing has released a 16-port stackable Token Ring hub. The hub can be stacked with existing Ethernet hubs allowing a mix of Ethernet and Token Ring. Management of a mixed stack can be carried out by a single management module located in one of the hubs.

The Token Ring TR516, a 16-port hub, joins the range of 516 Ethernet hubs. The series allows for segmentation but SNMP support is optional. Star redundancy, supported by the card, allows critical devices two links to a hub; one port active and one in standby mode in case of failure of the primary port.

The TR516XC 16-port Token Ring hub retails for \$4488. Its Ethernet counterpart, the 516XC costs \$2388. More information is available from INC on 008 807 982.



INC's 516 series hubs now offer Token Ring support

New SMC NICs offer 'plug and play' and PCI

The new SMC EtherEZ has been designed for unassisted configuration when installed in a machine with a 'plug and play' PC BIOS, Microsoft's soon to be released 'Chicago' or Plug and Play utility software.

The new card, a 16-bit ISA adaptor available for 10BaseT, thin coax or a combination of the two, can be installed in one step in machines lacking plug and play thanks to SMC's configuration software. The card supports major operating systems and includes an SNMP agent for remote management.

SMC is now shipping a PCI LAN adaptor that features 32-bit bus mastering to maximise throughput and minimise CPU load.

The SMC EtherPower comes with a range of drivers that should cover most server and client requirements. The card — autoconfigurable on powering on the system — has been tested with a wide range of hardware at SMC's Irvine, California quality assurance labs.

The SMC EtherEZ costs \$185 while the PCI-based EtherPower is \$305. More information is available from SMC on (02) 238 2206.

IMPROVED

Norton Administrator for Networks version 1.5

Symantec's popular network management tool has been expanded to offer support for major desktop operating systems including Macintosh and OS/2.

The Norton Administrator for NetWorks provides centralised administration for LANs. The product allows the network administrator to complete hardware and software inventories, monitor software licences, remotely configure workstations and automate software distribution. Other products can be integrated into the console including Norton Anti-Virus, Norton pcAnywhere and Norton Utilities.

"Now that Norton Administrator for Networks' reputation as a total solution to all network administration and management requirements has been established, we are continuing to enhance the software's capabilities," said Garry Sexton, Symantec's managing director. ▲

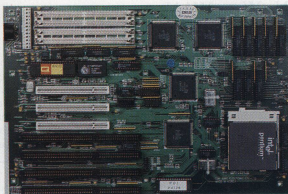
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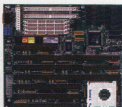
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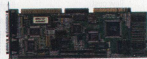
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Remedy for WAN bottlenecks

The new NLSP routing protocol will lead to more efficient NetWare WANs.

BY JEFFREY BAHER

Your internetwork is about to get a boost. A new protocol from Novell will enable NetWare servers and routers to communicate far more efficiently, unclogging

WAN lines and letting you build much larger NetWare networks. By year-end, the NetWare Link Services Protocol (NLSP) will run with NetWare 4.x and 3.x and Novell's multiprotocol router (MPR) version 3.0.

Not surprisingly, AT&T is expected to launch Connect Services, its US-wide NetWare LAN, at the same time. With connect services, companies will be able to tie their networks together through a network backbone. NLSP will be a key ingredient of Connect Services.

With NetWare's vast market presence and the potential for huge router sales from a successful deployment of Connect Services, NLSP has already garnered support from leading internetworking vendors, including Cisco, Wellfleet, 3Com, and AGC.

NLSP will replace two key protocols used by NetWare routers and servers today: the Routing Information Protocol (RIP) and the Service Advertisement Protocol (SAP). RIP is used by routers to share routing information with adjacent routers, while SAP is used by NetWare devices — servers in particular — to identify themselves to the rest of the network.

Though both RIP and SAP work over WAN connections, they were originally only intended for use in LAN environments and can lead to bottlenecks and inefficient routing decisions when used on a WAN.

Both RIP and SAP flood WAN lines every 60 seconds with network broadcasts. RIP is a distance-vector protocol, however, which means that broadcasts are sent out only to the router's immediate neighbours on the network, so no one RIP device

knows the full network path to all other devices — only those closest to it.

The future: NLSP

NLSP should remedy the problems associated with both RIP and SAP in two ways. First, it enables routers to make decisions more quickly and with more intelligence. Second, it will increase WAN efficiency by significantly reducing the number of broadcasts made over WAN links.

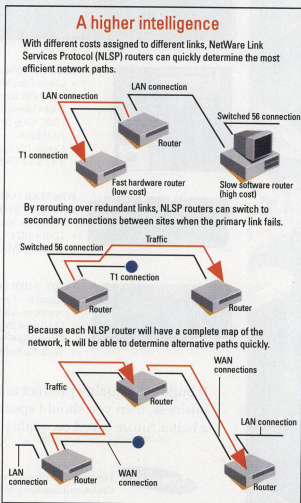
Using NLSP, each NetWare device will maintain multiple internal databases, including Adjacency and Link State databases. The Adjacency database tracks the device's direct network links and immediate neighbours. The Link State database is the connectivity map for the entire network, which will allow NLSP devices to arrive or converge on a route far faster than RIP devices can. This is crucial for effective operations in a large WAN.

Also by associating a cost to every link, NLSP will allow devices to choose the most efficient path for network traffic. With this feature, managers can associate a higher cost to a certain device, such as a relatively slow software router only when the primary router fails.

NLSP will enable routers to make more intelligent decisions than RIP and SAP and will also have less of an impact on overall bandwidth, because it will not utilise repetitive broadcasts. Instead, NLSP routers and servers will broadcast only when there is a change in the network configuration.

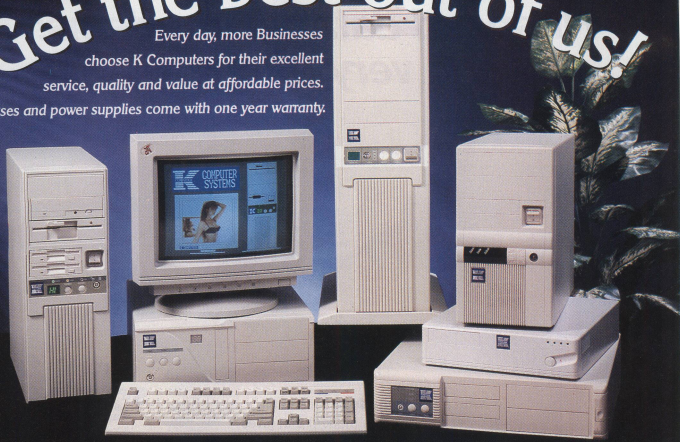
NLSP will also utilise redundant links to provide alternative paths between routers.

To maintain compatibility with RIP and SAP devices, NLSP devices will automatically detect the presence of those routers and servers and generate periodic RIP and SAP broadcasts.



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Even though they have no I/O capabilities of their own, DEBUG filters can solve many problems by manipulating file data.

BY JEFF PROSISE

Writing filters with DEBUG

Even after a dozen or so years of working with PCs, I'm still amazed at the wonderful, even magical things that can be accomplished with DEBUG scripts. DEBUG is one of the most powerful tools ever shipped with DOS. Among its many talents is the ability to compile assembly language program listings into .COM files that run just like the .COM and .EXE files provided with DOS.

Many of our readers' questions are easily solved with short DEBUG scripts. A typical scenario is summed up in the following letter:

Many of the shareware documentation files and other text files that I print on my computer have embedded form-feeds (ASCII 12 characters) that do little more than consume paper when they are printed. This seems a waste when a page has just two or three lines of printed text, especially when these pages occur throughout the document. Is it possible to delete these form-feeds so that printing will be continuous?

There are manual ways to eliminate unwanted form-feeds, of course. You could load the text files into a text editor or word processor and edit out the form-feeds. But doing manual work on a computer defeats the purpose of having the computer. Computers are supposed to do our work for us.

The form-feed problem is easily solved with DEBUG. To demonstrate, we'll use DEBUG to build a special type of program

called a DOS filter that strips the form-feeds from a file. Then we'll generalise the approach so that you can modify the filter to perform other useful tasks, such as converting tabs to spaces and replacing lowercase characters with uppercase.

Filters 101

A filter is a program that has no input and output capabilities of its own but instead relies on input and output redirection from the command line. DOS includes three filter programs: FIND, MORE, and SORT. (FIND will work as a standalone program too, so it's actually two programs in one.) To sort a text file named PHONES.TXT, you can't type SORT PHONES.TXT. Instead, you must type

```
SORT <PHONES.TXT> PHONES OUT
```

The less-than sign is an input redirection operator that tells SORT to take its input from the file named PHONES.TXT. The greater-than sign is an output redirection operator that tells SORT to write the results — the sorted output — to PHONES.OUT. It's important to give different names to the input and output files because of the limited size of SORT's input buffer. If the files are more than a few kilobytes in length, and you give the output the same name as the input, SORT will corrupt the file. If you want the sorted output to be

named PHONES.TXT, simply delete the original file after SORT is finished and rename PHONES.OUT to PHONES.TXT. Users of DOS 5.0 and later can employ the command `MOVE PHONES.OUT PHONES.TXT` to replace the original with the sorted file. Filters may be a little awkward to use, but they're simple to write. DOS manages all the file I/O itself (via the redirection operators), so the filter is responsible for little more than manipulating the I/O stream. When it comes to stripping form-feeds, a filter's task is simple. In pseudo-code, the algorithm goes like this:

```
input a character  
if (character = form-feed)  
  do nothing  
else  
  output the character
```

In plain English, this translates to reading a byte from the input stream and either ignoring it (if it's a form-feed) or writing it to the output stream (if it's not a form-feed). Repeating this procedure for every byte in the input file produces a separate version of the file with form-feeds removed.

Figure 1 lists the assembly language DEBUG script for STRIP.COM, a filter program that uses this algorithm to strip form-feeds from text files. To enter the script, type DEBUG at the DOS prompt to start

```

A 100
;Start
MOV AH,3F                ;Read one byte from
MOV BX,00                ;standard input
MOV CX,01
MOV DX,1000
INT 21
JB 0123                  ;Jump to End if read failed
OR AX,AX                 ;Jump to End if end of file has
JZ 0123                  ;been reached
CMP BYTE PTR [1000],0C   ;Is the byte a form feed?
JZ 0100                  ;Yes, then Jump to Start
MOV AH,40                ;Otherwise, write the byte to
MOV BX,01                ;standard output
INT 21
JNB 0100                 ;Jump to Start if write succeeded
;End
RET                      ;End the program

N STRIP.COM
RCX
24
W
Q

```

Figure 1: When entered into DOS's DEBUG program, these commands create STRIP.COM, a DOS filter that strips all of the form-feed characters from any text file

DEBUG. Then enter the lines as shown. (You do not need to type in the comments — the text preceded by semicolons.) You must include the blank line between the RET instruction and N STRIP.COM command; otherwise, DEBUG will think N STRIP.COM is an assembly-language instruction and will reject it since no such instruction exists. A preferable alternative to typing directly into DEBUG is to enter the commands in a text file called STRIP.SCR and process the whole file at once by typing **DEBUG <STRIP.SCR**.

The first instruction in the script, A 100, tells DEBUG to begin assembling code at offset 100h (that is, 100 in hexadecimal — or base 16 — numbers) from the base of the segment in which the program will be loaded. This location is standard — indeed, mandatory — for .COM files.

After this come the assembly-language instructions that make up the program. The instructions

```

MOV AH,3F
MOV BX,00
MOV CX,01
MOV DX,1000
INT 21

```

use DOS function 3Fh (Read File or Device) to input 1 byte of data (the 1 we put in CX indicates this) from the file or device whose handle (passed in register BX) is 0. DOS assigns file handle 0 to the virtual device known as *standard input*. By default, characters read from standard input come from the keyboard. When input is redirected, standard-input data comes from the file or device whose name appears to the right of the input redirection operator. The byte that is read from the file

is copied to offset 1000h of the segment in which the .COM file is loaded, as specified in the DX register.

In the unlikely event that the read operation fails (in which case the INT 21 call will return with the carry flag set to 1), the instruction

```
JB 0123
```

branches to the RET instruction that ends the program (offset 0123h). The JB command is synonymous with JC (which stands for jump on carry). I use the JB here because that's how DEBUG presents it if

you use the D command to disassemble the code. If you'd like, you can substitute JC for JB anywhere that it occurs.

Next come the instructions

```
OR AX,AX
JZ 0123
```

which terminate the program by branching to the RET instruction when there are no more bytes to be read. Function 3Fh returns the number of bytes that were read in register AX. If AX is 0, then we've reached the end of the file. (ORing a register with itself is a common way to check for a zero value. If the register holds a 0, then the Z flag will be set to 1, and a JZ instruction will cause a branch.) Without these instructions, the program would loop forever, not recognizing when it had reached the end of the file. Now that STRIP has a byte of data from the file in memory location [1000h], it must decide what — if anything — to do with it. The instructions

```
CMP BYTE PTR [1000],0C
JZ 0100
```

jump back to the beginning of the program (the MOV AH, 3F instruction at offset 100h) if the byte is a form-feed — ASCII 0Ch. Otherwise, execution falls through to the instructions

```
MOV AH,40
MOV BX,01
INT 21
JNB 0100
```

which call on DOS function 40h (Write to

```

A 100
;Start
MOV AH,3F                ;Read a byte and terminate
MOV BX,00                ;if the end of file is reached
MOV CX,01                ;or an input error occurs
MOV DX,1000
INT 21
JB 012F                  ;Jump to End
OR AX,AX                 ;Jump to End
JZ 012F                  ;Jump to End
CMP BYTE PTR [1000],61   ;is less than 61h (a)
JB 0126                  ;Jump to NoChange if the byte's value
CMP BYTE PTR [1000],7A   ;is greater than 7Ah (z)
JA 0126                  ;is greater than 7Ah (z)
AND BYTE PTR [1000],DF   ;Otherwise convert to uppercase
;NoChange
MOV AH,40                ;Write the byte to the output
MOV BX,01                ;file and loop back for more
INT 21
JNB 0100                 ;Jump to Start
;End
RET                      ;End the program

N CASE.COM
RCX
30
W
Q

```

Figure 2: This DEBUG script creates CASE.COM, a filter that converts all of the lowercase characters in a text file to uppercase characters

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```

:100
:Start
MOV    DI,08                                ;DI=Tab length (8 spaces)
:NOResetDI
MOV    AH,3F                                ;Read a byte and terminate
MOV    BX,00                                ;if the end of file is reached
MOV    CX,01                                ;or an input error occurs
MOV    DX,1000
INT    21
JB     014D                                ;Jump to End
OR     AX,AX
JZ     014D                                ;Jump to End
CMP    BYTE PTR [1000],09                 ;Jump to IsTab
JZ     013F                                ;if it's a tab character
MOV    AH,40                                ;Otherwise write the character
MOV    BX,01                                ;to standard output
MOV    CX,01
MOV    DX,1000
INT    21
JB     014D                                ;Jump to End if the carry flag is set
CMP    BYTE PTR [1000],0A                 ;Jump to Start and reset DI if this
JZ     0100                                ;is the end of the current line
CMP    BYTE PTR [1000],0C                 ;or the end of the page
JZ     0100
DEC    DI
JNZ    0103                                ;Otherwise just decrement DI
JMP     0100                                ;Jump to NoResetDI if DI is not 0
;IsTab
MOV    AH,40                                ;Come here when a tab is found,
MOV    BX,01                                ;and write the number of spaces
MOV    CX,DI                                ;in DI to standard output
MOV    DX,014E
INT    21
JNB     0100                                ;Jump to start and reset DI
;End
RET
DB     20,20,20,20,20,20,20,20,20

```

Figure 3: This DEBUG script creates EXPAND.COM, a filter that converts all of the tab characters in a file to space characters.

File or Device) to write the byte to standard output, whose file handle is 1. Standard output is, of course, the file or device name to the right of the output redirection operator if output redirection was used on the line that invoked the command. In the absence of an output redirection operator, standard output goes to the screen. If the carry flag is clear after the INT 21 instruction, indicating that the write succeeded, execution loops back to the beginning of the program. If an error occurs and the carry flag returns set to 1 (again, an unlikely event), execution falls through to the terminating RET instruction. There you have it: a complete filter program that strips form-feeds. Once the .COM file is created, the command

STRIP <ANYFILE.TXT> ANYFILE.OUT

strips the form-feeds from ANYFILE.TXT and stores the results in ANYFILE.OUT. To automate deleting the original file and renaming the output file to the original filename and to display a message if the user doesn't type a filename after the command, you could use a batch file like this one:

```
@ECHO OFF
IF '%1'==' ' GOTO SYNTAX
STRIP <%1> TMP@@@.$$$
DEL %1
REN TMP@@@.$$$ %1
GOTO END
:SYNTAX
ECHO Syntax: %0 filename
:END
```

If the batch file is named BSTRIP.BAT, then the command

BSTRIP ANYFILE.TXT

will strip the form-feeds from ANYFILE.TXT. Be careful when you use this batch file. If an I/O error prevents STRIP from processing the file properly, you'll lose the original file, because the batch file deletes it. STRIP.COM doesn't return an exit code indicating success or failure, so the batch file doesn't know any better. We could remedy this by adding a few more lines of code to the filter, but at this point we should keep things as simple as possible. Also, STRIP.COM should be used only on plain ASCII text files and not on word processing files. STRIP.COM will

likely destroy a word processing file stored in non-ASCII format.

The good news is that many of the programming instructions are boilerplate and that it's easy to modify STRIP to create filters of your own. Give a man a fish and he'll eat for a day, but teach him to fish and he'll eat for life. With a little luck, you'll soon be designing filters custom fit to your needs. The next example demonstrates how.

Converting case

Suppose you wanted to modify the STRIP filter to convert lowercase characters (characters whose ASCII codes fall in the range 61h to 7Ah) to uppercase (characters with ASCII codes from 41h to 5Ah). How would you do it? The answer is shown in Figure 2.

The DEBUG script for CASE.COM differs only slightly from the script for STRIP.COM. The destinations of conditional jump instructions (JZ, JB, and so on) have been changed to reflect the changed locations of their targets, and the 24 following the RCX command near the end of the file has been changed to 30 to reflect the new .COM file length of 30h (48 decimal) bytes.

Determining jump addresses is one of the more painful parts of writing programs with DEBUG, because you don't know what address to enter if the target statement comes later in the program. One solution is to supply dummy addresses as you enter a program, and then to go back after all the instructions are entered and substitute the correct addresses.

Determining what value to enter following the RCX command is easier. After you enter the final instruction in the program and hit Enter once more to enter a blank line, note the offset address DEBUG displays to the left of the blank line. Subtract 100h and that's the number that should follow the RCX command. The functional difference between the programs is found in the lines

```

CMP    BYTE PTR [1000],61
JB     0126
CMP    BYTE PTR [1000],7A
JA     0126
AND    BYTE PTR [1000],DF

```

STRIP.COM examined the byte value read from standard input and looped back if it was a form-feed, skipping the step that wrote the value to standard output. CASE.COM treats characters a little differently.

If the value is less than 61h or greater than 7Ah, CASE.COM branches to 0126h, which corresponds to the statement MOV AH,40. If the value falls between 61h and 7Ah (in other words, if the byte read from

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the file represents a lowercase ASCII character). CASE.COM capitalises the character with an AND instruction that zeros bit 5. This is a convenient and often-used case conversion technique that exploits the fact that the only difference between uppercase and lowercase ASCII letters is the setting of bit 5. The upshot of all this is that if the character was a lowercase letter, it gets converted to uppercase before it is output. Otherwise, it gets written to standard output unmodified.

Converting tabs to spaces

While we're at it, let's look at one more example program: a filter that converts tab characters to spaces. This one is a little more complicated, but the basic principles still hold. We'll assume that tab stops are set every eight spaces, so any tab character (ASCII 09h) encountered in the input file should be converted to one to eight spaces in the output file, depending on where in the line the tab character occurred.

Figure 3 shows what it looks like in code. The general approach here is to

initialise the DI register with the tab length (8) and work through the file byte by byte. When a nontab character is encountered, DI is decremented by 1, and

CASE.COM exploits the fact that the only difference between uppercase and lowercase ASCII letters is the setting of bit 5.

the character is written to the output file. Whenever DI reaches 0 or a line-feed or form-feed character is encountered, DI is re-initialised to 8. At any given time, DI holds the number of spaces required to get us to the next tab stop. When we do encounter a tab character, we simply output the number of spaces in DI and then go on to the next character.

We won't take the time to analyse EXPAND.COM line by line; the comments should be enough. Do note, however, that you can change the tab length by changing the value loaded into DI at the beginning of the program. If you prefer tab stops spaced four characters apart, for example, change the line to read

MOV DI, 4

Be aware that if you want tab stops spaced greater than eight characters apart, you'll have to increase the number of space characters (ASCII 20h) accompanying the DB (define byte) command by a commensurate amount. You'll also have to increase the number following the RCX command to make room for the extra data at the end of the file.

You can download all DEBUG scripts and binary files mentioned in this column from Mag-disk.

Further reading

Filters are handy tools for manipulating ASCII text files. If you're interested in learning more about filter programs and the mechanisms that underlie input and output redirection, read the chapter entitled "Writing MS-DOS filters" in Ray Duncan's *Advanced MS-DOS*. The book is showing its age, having not been updated since DOS 4.0, but it's still an invaluable reference work. You won't find any discussions of present-day versions of DOS, but the information that is there is still just as good — and just as accurate — as it was the day the book was written. ▲

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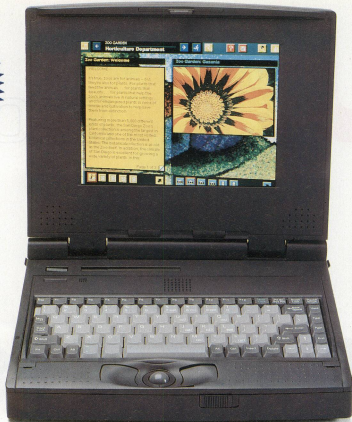
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That said, however, while your DOS and Windows programs will usually perform reasonably well under Personal OS/2 without any intervention on your part, spending a little time to tune the settings for these applications can produce significant improvements in performance. These settings will affect not only the program being tuned but also all other applications that are

running concurrently. In this column, I'll concentrate on Windows programs; next time, I'll look at the underlying DOS settings that can influence the performance of both DOS and Windows applications.

Window panes

The decision that makes the most dramatic visual difference is whether you are going to run the program in a full-screen session or in a window on the OS/2 desktop. For DOS programs under Windows, the difference between 'in a window' and 'full screen' is clear. For Windows programs under OS/2, however, the distinction is more subtle. Just as two pieces of fabric joined together with no visible separation are said to be seamless, OS/2 allows its programs and Windows programs to run side by side on your OS/2 desktop, creating a seamless connection of operating environments.

When you become accustomed to OS/2's graphical user interface (GUI), you will likely want to run everything from the OS/2 desktop, where you can minimise and restore the sessions at will. Unfortunately, this requires a lot of overhead,

because OS/2 must manage a great deal of additional information about the session. The first rule, then, for tuning DOS and Windows applications under OS/2 is simple: every program will run more quickly in what OS/2 calls full-screen mode. Here, full screen doesn't mean that the program's window must be maximised. Rather, it means that the Windows application is not seamlessly integrated with the OS/2 desktop. Windows applications will run fastest if you start the Windows desktop and run them from there rather than under the Win-OS/2 Program Manager.

Personal OS/2 improves the performance of seamless Windows applications considerably, however, with its Fast Load facility. This feature loads the Win-OS/2 overhead during the boot process so that when you are ready to start your Windows application, only the program itself needs to be loaded. Most of the start-up of Fast Load takes place after the OS/2 desktop is in place, so you can start other things at the same time. A second or two delay during boot-up won't make much difference, but when you double-click on your application without Fast Load, you'll notice every moment's delay.

Using more memory than you have

OS/2 lets you load more programs than you have physical memory for. It does so by swapping parts of your data to disk when they aren't being used and then reloading them when they are needed.

While this is handy, the more swapping you do, the more slowly your system will run, since hard disks are significantly slower than your computer's internal memory. Changing your settings so that less memory is used will usually reduce swapping and will consequently speed up your entire system.

On the other hand, if you have plenty of physical memory available and aren't running several programs simultaneous-

ly, your program may speed up if you allocate more memory to it. Your application's documentation should give you an idea of how much memory it needs. You should give it all it needs but no more.

To help you decide, check the size of your SWAPPER.DAT file just after you start OS/2 and before you load any programs. If the file is already 6M, you're in a heavy swapping situation and should be frugal when allocating memory (you should also consider adding memory to your machine). If, after loading a couple of your typical programs, this file is still 4M or less, you can consider allocating more memory to those programs.

As OS/2 now ships, Fast Load is off by default. IBM has indicated that it is considering changing the settings so that Fast Load will be on by default. Now, however, you must open the OS/2 System folder and the System Setup folder within that to activate Fast Load. You can then open the Win-OS/2 Setup Notebook and click on the Win-OS/2 Settings push button. Change the Fast Load setting to On, and the next time you boot-up your system, Fast Load will be active.

DOS and WIN-OS/2 settings

The key to finer control over your DOS and Windows programs is the Settings Notebook, which lets you precisely determine the characteristics of the session in which you run your programs. If you simply load a program from a command line or the Program Manager, it runs with the general default settings for those command sessions, which may not be best for that specific program. One of the strongest arguments for creating separate program icons for each of your applications is the ability to establish settings separately. The easiest way to create separate icons for your programs is with OS/2's application migration facility. Migration in OS/2 terminology doesn't mean that you move your application from Windows to OS/2. It simply means adding a new icon for the application on the OS/2 desktop. With the new, separate icon, you can change the settings specifically for running the program under OS/2. Open the OS/2 System folder and the System Setup folder within it and you'll find Migrate Applications. Open this program and you'll see the dialog box shown in Figure 1. Select the drive or directory that contains your DOS and Windows programs, and OS/2 will automatically detect the programs that you have installed there. You will be presented

with a dialog similar to the one shown in Figure 2. The dialog box will contain all of the DOS and Windows programs OS/2 found. When you now click on Migrate,

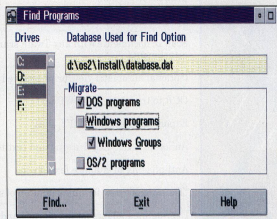


Figure 1: This shows OS/2's Migrate Applications program

the programs selected from this list will have icons created for them on the OS/2 desktop in folders labeled DOS Programs, Windows Programs, and Win-OS/2 Groups. Even better, those icons will have predefined settings that should work better than the system defaults. In other words, just by migrating the application to a desktop icon, you will also be speeding it up. That may be all that you need or want to do. Note, though, that the only applications you can migrate will be those contained in the database that comes with OS/2. Thus, not all your programs may be found and migrated. For those not included, you'll want to drag a Program Template (found inside the Templates folder) onto the desktop to create your own desktop object for this program.

Whether your icon was created by migration or manually, you may want more direct control of the settings. This is espe-

cially true if you have less than 8M or more than 12M of memory and want to use it properly. To change the settings of any desktop object, click on the icon with the left mouse button (unless you reconfigured OS/2 for left-hand mouse usage). This opens the object's pop-up menu. The top line should be Open. Click on the arrow beside Open and you'll get the secondary menu; clicking on Settings from that menu will open the Settings Notebook. The important functions are on the second page, so click on the right arrow at the bottom of the dialog to move to page two.

Windows-specific settings

Most of the second page is devoted to establishing the type of application and whether it will run in a window or full screen. As indicated earlier, your program will run more quickly in full-screen mode, but a slight decrease in performance is a reasonable trade-off for the convenience of having everything on the desktop. If this

is a Windows program, you have an additional decision to make here: whether to run this program in a separate session. Relevant considerations are discussed in the accompanying sidebar, 'Have more memory than you have'. One advantage to running Windows applications under OS/2 rather than Windows is the additional crash protection that OS/2 provides. Because each session runs in its own address space, if one Windows application crashes, that application won't bring down the rest of the system. Unfortunately, that adds a lot of overhead. If you are running more than one Windows program at a time, each has to have its own copy of the Win-OS/2 software. This adds several seconds to the program's load time and 2M to the memory required.

You can, however, choose to run Windows applications in the same session. By doing so, all of the Win-OS/2 overhead is loaded with the first application. That first application must have enough memory allocated for all Windows programs that will be loaded into that session. Use Fast Load to do this, since it acts as the first application and automatically ensures that subsequent applications can access the memory allocated in their own settings.

If the first application doesn't have separate session selected, subsequent Windows programs will be added to the existing session without the delay and the additional memory needed for another copy of Win-OS/2. The downside to this is that now if any of those programs crash,

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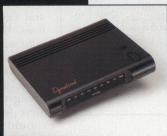
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they can bring down the other Windows programs with them. OS/2, OS/2 programs, DOS programs, and Windows programs in separate sessions are all still protected. The lower-level details can be accessed by clicking on the Settings push button to bring up the list of all the changeable settings, as shown in Figure 3. Rather than trying to discuss them all, let's focus here on the settings that most directly affect the performance of your program and of other programs running at the same time. The first four settings (OS/2 uses the same word for what you might call a setting parameter and its value) appear only for Windows programs. For reasons I can't fathom, IBM put the entire list in alphabetic order except for these important four:

- **WIN_RUN_MODE** (the default value is 3.1 Standard): With Version 2.1, OS/2 has eliminated one of the bigger restrictions of earlier versions: the inability to run programs that required Windows Enhanced mode. (The new OS/2 sacrifices the ability to run Real-mode programs, but little is lost since Windows 3.1 itself doesn't support those programs.) Enhanced sounds much more exciting than Standard, but don't give in to the urge to change the setting of all your Windows programs to Enhanced. Standard mode is actually faster in most cases where you have a choice. Of course, many current Windows applications require Enhanced mode, but don't use it where it isn't needed. Your application's documentation should tell you whether it requires Enhanced mode. If there is a question, just try running in Standard mode; if the program crashes, you'll know that it needs Enhanced mode.

Since Fast Load is an Enhanced-mode program, any applications that share its session may be Enhanced or Standard. If you're not using Fast Load and the application is being run in a shared session, you should set it as Enhanced if any of the programs that share its session require Enhanced mode.

- **WIN_DDE** (default is Off): This setting determines whether you can establish Dynamic Data Exchange (DDE) links between Windows and OS/2 programs. Set this to On if you need DDE between program types, but doing this will add a lot of overhead, so don't change it unless you're sure you'll use it with this session.

- **WIN_CLIPBOARD** (default is On): A very congenial feature of OS/2 is its ability to cut and paste between Windows and OS/2 programs. If you're sure a particular Windows program won't be sharing data with OS/2 programs, you can get a slight performance boost by changing the setting to Off.

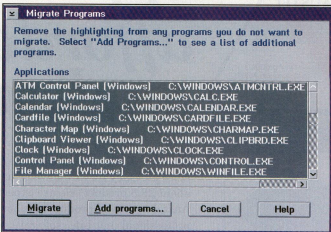


Figure 2: Here's how you select the applications to migrate

- **WIN_ATM** (default is Off): One of the differences between OS/2 and Windows is that OS/2 has standardised on Adobe Type Manager (ATM) fonts and Windows has standardised on TrueType fonts. By loading the ATM in your Win-OS/2 session, you can use the ATM fonts you have installed with your Windows applications as well. If you don't want to use ATM fonts in your Windows program, you can save the memory and the start-up time of loading ATM by leaving this setting Off. Providing this setting in Personal OS/2 gives you the ability to add the ATM overhead for specific Win-OS/2 sessions (such as a word processor) in which you need that function.

Making global changes

If some settings seem appropriate for all of your Windows programs, you can make a global settings change by going to the Win-OS/2 set-up object. Open the OS/2 System folder and the System Setup folder within it and you'll find Win-OS/2 Setup. Opening that object reveals a notebook that looks much like the Settings Notebook. The difference is that changes made here apply to all Windows sessions. Use this facility sparingly. After all, the reason you migrated your applications to the desktop was so that you could establish different settings for each of them. I suggest you limit your

activities here to the second page, where you establish whether DDE links and the Clipboard are private to Win-OS/2 or public (shareable) with OS/2 programs. If you are going to be sharing information between Windows and OS/2 applications, by all means take advantage of this outstanding feature. On the other hand, if you aren't going to be using these features, you should definitely

change these settings to Private. This will greatly decrease the overhead required for Win-OS/2 sessions and speed up your Windows programs. Even if you are going to cut and paste between Windows and OS/2 programs, you can still set the DDE link to Private and get a nice performance improvement.

Don't assume IBM knows best

Migrating your applications will establish settings that OS/2 provides as a good starting point. Those settings, however, aren't necessarily the best for your particular system. Don't hesitate to tweak your settings in an attempt to improve performance. When you do, follow standard scientific procedure: change only one setting at a time and then check for the effects. That makes determining which specific changes helped or hurt easier, and you're more likely to remember what the original setting was when you decide to change it back. You can make IBM's good thing even better. ▲

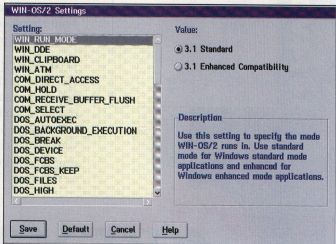


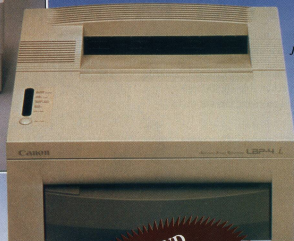
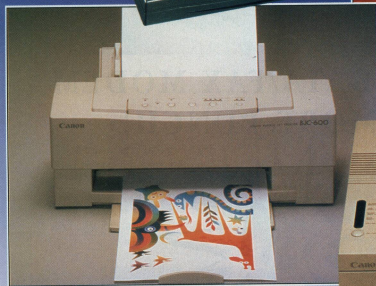
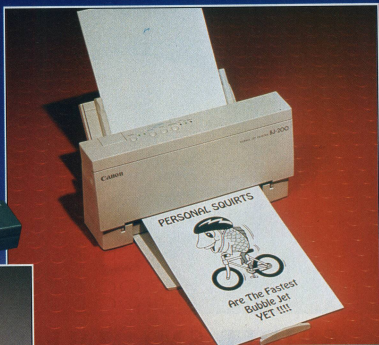
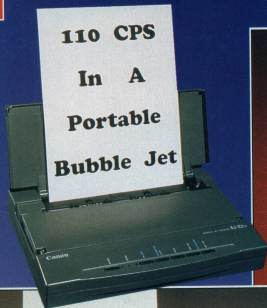
Figure 3: This shows how to change the Win-OS/2 settings

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FreeUp is a more than able replacement for the frequently maligned Windows File Manager, and it doesn't just FreeUp your time.

BY RICHARD GOULSTONE

FreeUp yourself

FreeUp is a Windows 3.1 file and hard disk manager similar to (but with less features than) such commercial packages as PC Tools and Xtree Gold. It is easier to read and understand and quicker to use than the Windows File Manager, with more options to boot.

With programs such as this you don't have to use DOS to do your file management such as copying, deleting or renaming files and directories. FreeUp was written in Turbo C++ Visual Edition For Windows, by Thomas Grubbe. As is the case with a lot of the programs that are discussed in this column, Thomas originally started writing FreeUp to learn C programming in Windows. From small beginnings it has turned into a very capable shareware utility. You can obtain a shareware copy of FreeUp by mail (see the sidebar 'How to obtain a copy of FreeUp').

Setting up

There are a couple of things that must be done before running FreeUp once it has been copied to your hard drive (you can run FreeUp from any directory on your hard disk). Make sure that the field StartUpDir= in the FREEUP.INI file (see Figure 1) reflects the directory FREEUP.EXE is in, and put FREEUP.INI in your Windows directory. Then put the file CTL3DV2.DLL (a C++ library unit) in your WINDOWS/SYSTEM directory for the 3D dialog controls (the program will give you an error message if this file isn't found, but

;FREEUP.INI		
[FreeUpDefaults]	[Fonts]	[ZipOptions]
StartUpDir=c:\WINMAG\	FontName=Roman	ZipDestPath=C:\ZIPS
FREEUP	FontStyleName=Regular	ZipMethod=2002
DefaultEditor=C:\	FontStyle=400	StorePaths=0
DefaultViewer=C:\	ItalicStyle=0	RecurseSubDirs=0
SortBy=316	FontHeight=16	MoveFiles=0
SortOrder=1	FontWidth=0	MakeSelfExtracting=0
CenterBar=223	LowerCase=0	No80386Usage=0
DirSizeInfo=1	[StartUp]	NoEMSUsage=1
UseCustomPathNames=0	WindowLeft=5	NoXMSUsage=0
	WindowTop=30	No32BitUsage=1
	WindowRight=648	SlowMemCpy=0
	WindowBottom=388	ZipMethodIndex=0
	WindowState=3	

Fig 1: The INI file. It can be changed in a text editor but must be stored in the WINDOWS directory

the program will still run). You may also want to edit FU_ZIP.PIF to point to the directory on your hard disk where PKZIP.EXE is in. Lastly, you can make another change to the FREEUP.INI file, edit the fields DefaultEditor= and DefaultViewer= by adding your favourite Windows text editor's name and path. This will enable you to view and edit text files through FreeUp (if these are left blank, an error message will be displayed if you try to view or edit a text file).

Menus, options and toolbar

The layout and graphics of FreeUp are very neat and easy to read (see Figure 2). Each

file listed is represented by a graphic symbol (such as a coloured frame for a picture file or a picture of a document for a text file) as well as displaying the name, size in bytes, date created and attributes.

The directory tree listing also shows how many bytes are in each directory (and the directory tree structure), and how much space is left on that particular drive (FreeUp also works with floppy and CD-ROM drives as well as with any hard drives you may have).

If you 'select' a file or directory to work with, four of the options on the toolbar become available — move, copy, delete and rename — otherwise these options are disabled.

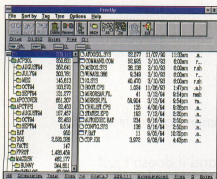


Fig 2: The main screen of FreeUp. This shows the directory tree and files in each directory, as well as the toolbar and menus across the top

Toolbar

The toolbar options (reading from left to right) are VIEW (a text file), COPY, MOVE, DELETE, RENAME, TREE (for re-reading the directory tree's structure), MKDIR, ALL (for selecting and de-selecting all the files at once), ZIP, FIND (search for a text string in selected files) and EXIT. If you select the ZIP function an options screen will appear (see Figure 3). This makes it much easier to use all the functions of PKZIP rather than using DOS. The many switches and options it has are now easily selectable with the mouse!

Menus

File

The File Menu contains most of the options that are on the toolbar, as well as one extra, 'Attributes', that lets you change the attributes of selected files (that is, to or from Read Only, System and Hidden).

Sort by

You can sort the file listings by name, extension, size and date, and each option can either be in ascending or descending order.

Tag

You can tag and untag (select and de-

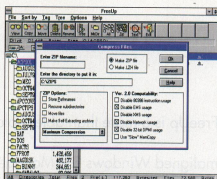


Fig 3: The Compress options screen as it appears after pressing the ZIP toolbar button. Note that the LHA option doesn't actually exist yet!

select) using the options here, as well as doing an 'invert' tag — untagging all currently tagged files and tagging all currently untagged files.

Tree

Some of the same options as on the toolbar as well as 'Custom Path Description'. You've heard of the much awaited long filenames (that is, more than eight characters) that are coming in Windows 4. With the 'Custom Path Description' option you can add long descriptions to your directory names (of course only FreeUp will be able to display these).

Options

Here are located the options for 'customising' FreeUp, such as changing font styles (can access any fonts that you have installed under Windows). Also, if you select 'Default Options' you get a screen that enables you to change the various settings of FreeUp (see Figure 4).

How it works

Here is what Thomas Grubbe wrote about FreeUp and programming in general, he says "... what I've found out about Windows programming is that it takes months to do what an equivalent text-based DOS

application takes only weeks to develop. I wrote this application, in one sense, to help me solve a problem, in another, to allow me to learn to program Windows applications with a non-trivial approach to real-world application development". Anybody who has any experience with DOS and Windows programming knows exactly what Thomas is getting at when he talks about the time taken to write a program. Figure 5 shows a partial listing for the ZIP function and Figure 6 shows a partial listing of how the Move/Copy function is handled.

Summing up...

FreeUp is a good file manager that is technically at least the equal to the Windows File Manager, but with better ease of use. One gripe I have is that if you copy or move a file into the directory you are viewing, it doesn't automatically update the screen display. To see the new file you must first re-click on the directory name from the directory tree listing on the left of the screen. Also the LHA option has been omitted (though PKZIP is still catered for). Those two points aside, FreeUp is a very useful program that will appeal to anyone who is tired of going into DOS to manipulate or compress files, now it can be done quickly and easily in Windows.

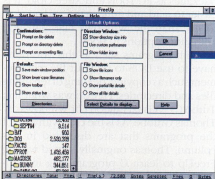


Fig 4: The 'Defaults Options' screen lets you set up FreeUp exactly how you want it

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Signature: _____ Expiry date: __ / __

```
ReadZipOptions();
ZipFilesProc = MakeProc-
Instance((FARPROC)ZipFilesDlgProc,
ghInstance);
nRet = DialogBox(ghInstance,
"ZipFilesDlg", ghwndMain,
(DLGPROC)ZipFilesProc);
FreeProcInstance(ZipFilesProc);
```

```
if (nRet != IDOK)
return (nRet);
```

```
FlushMsgLoop();
WriteZipOptions();
```

```
getcwd(CurrPath, 128);
LogPath(StartUpDir);
```

```
if (ZipMethod == IDC_USELHARADIO)
DoLZHCompression();
else
DoZIPCompression();
```

```
LogPath(CurrPath);
return (IDOK);
```

```
int CopyMove(int MenuID)
{
    int nRet, Idx1, Idx2;
    FARPROC CopyMoveProc, ActionProc;
    char ErrorTitle[80];

    clearGlobalStructs();

    NumSelected =
    GetTaggedFileCount();

    if (NumSelected == 0 || FileCount
        == 0) {
        if (MenuID == IDM_COPY)
            lstrcpyp(ErrorTitle, "Copy
            Error");
        else
            lstrcpyp(ErrorTitle, "Move
            Error");
        FreeUpMsgBox(MB_OK |
            MB_ICONINFORMATION,
            (LPSTR)ErrorTitle,
            "No files are selected");
        return (IDCANCEL);
    }

    if (NumSelected == FileCount)
        ActionCmd = MOVEALL;
    else if (NumSelected == 1)
        ActionCmd = MOVEFILE;
    else if (NumSelected 1)

```

```
ActionCmd = MOVETAGGED;

if (MenuId != IDM_COPY)
    ActionCmd |= 0x0f;

CopyMoveProc =
    MakeProcInstance((FARPROC)CopyMoveDlgProc, ghInstance);
nRet = DialogBox(ghInstance,
    'CopyMoveDlg', ghwndMain,
    (DLGPROC)CopyMoveProc);
FreeProcInstance(CopyMoveProc);

if (nRet == IDCANCEL)
    return (IDCANCEL);

ActionProc =
    MakeProcInstance((FARPROC)ActionDlgProc, ghInstance);
nRet = DialogBox(ghInstance,
    'ActionDlg', ghwndMain,
    (DLGPROC)ActionProc);
FreeProcInstance(ActionProc);

if (nRet == IDERR)
    return (IDERR);
return (nRet);
```

Quick reference guide

FreeUp

Purpose:

FreeUp is an alternative to the Windows File Manager which will allow you to 'manage' files and directories, that is move, copy, delete and rename. Also lets you change file attributes and displays information about each file, such as size and the date of creation.

Setup:

FREEUP.INI must be edited and the path of where **FREEUP.EXE** is on your hard drive added. This INI file should then be copied to the **WINDOWS** directory. Other changes can be made to this file, which will enable you to view and edit text files and compress files with **PKZIP**.

Remarks:

If you don't like the Windows File Manager it may be worth having a look at FreeUp, it has much the same features but is easier and quicker to use.

Fig 5: Section of the code for the ZIP file function

Fig 6: This is a partial listing for the Copy/Move function, selected either from the toolbar or file menu.

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WORD PROCESSING

Shading

TIP: I often use the shading facility to highlight sections of Word documents and tables. However, having to go through the sequence Format, Border, Shading, Pattern, five per cent, OK, OK every time is enough to put anyone off the idea. I also wanted to be able to undo the shading easily, so I wrote this macro (see Figure 1). The macro is a toggle facility which checks the current 'shade' status and reverses it. If you assign this macro to a button on your toolbar, one quick stab with the mouse is all you need to shade or 'unshade' the current line or cell or selection. Note that if your selected text contains a mixture of different shadings (including none), the macro will not make any

changes. The selected area must have uniform shading (or none).

**Tony Whelan,
Woden, ACT.**



To modify the degree or type of shading in this macro, change the figure in line 9 ('STATE = 2') to any number between 1 and 25. You could also change the default it toggles between by changing line 11 ('STATE = 0'), again to between 1 and 25 (0 being clear). These numbers refer directly to the list of shades in the 'SHADING' dialog box in the 'FORMAT'/'BORDER' menu.

Richard Goulstone

MS info

Upon installing Microsoft Office 4.0 for my brother's notebook, I had to trim off unnecessary files to save precious hard disk space. When I walked through the custom installation menu of WinWord 6.0 in option Tools, I was prompted for an option whether or not to install MS Info apart from Dialog Editor. Since it only takes up 40K of space, I decided to install it so that I could explore it later on. The MS Info is located in Help / About / System Info. I was impressed by the valuable information I could find. It has 11 categories, namely System, Printing, System DLLs, Fonts, Proofing, Graphics Filters, Text Converter, Display, Application Running and OLE Registration, with heaps of information listed within each category which can even be printed or saved for future reference. Examples are:

- System: size of memory, hard disk, swap file, and so on;
- Printing: installed printer drivers version, date, size and name;
- System DLLs: complete list of all DLL

installed, version, date, size and which one of them is now being used;

● Fonts, Proofing, Graphics Filters and Text Converter: concerned mainly with what the font substitutions are, which dictionaries are installed, which graphics filters and text converters are available, together with sizes and versions information;

- Display: information on display driver;
- Application: what applications are running.

The only disappointment I can say is that Microsoft did not make this MS Info a standalone file which can be accessed anywhere from Windows.

**Biggles Cheung,
Glen Iris, Victoria.**

```
Sub MAIN
On Error Goto wrong
If Not
CommandValid(FormatBorder$)
Then Goto wrong
Dim dlg As FormatBorder
GetCurValues dlg
STATE = dlg.Pattern
Select Case STATE
Case 0
STATE = 2
Case Else
STATE = 0
End Select
FormatBorder .Pattern = STATE
Goto bye
wrong:
Beep
On Error Goto 0
bye:
End Sub
```

Fig 1. This Word For Windows 2.0 macro will apply or remove shading for the current text selected

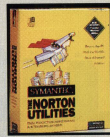


Thanks for that information Biggles, Microsoft sometimes 'hides' away useful programs like MS Info. If users want to try a standalone information utility, then MS Diagnostic is a more limited form of the program described above, just type MSD at the DOS prompt (version 6.0 onwards).

Richard Goulstone

Tip of the month

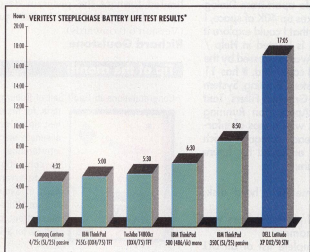
Congratulations to Geoff Salt of Coburg, Victoria, for his excellent tip on how to eliminate electrical interference. We'll be contacting Mr Salt to arrange a copy of Symantec Norton Utilities to be sent out, plus a cheque for \$100.



8 HOURS BATTERY LIFE

As a notebook owner you really need the maximum amount of time between battery re-charging. Recently the independent testing company, VeriTest, put the Dell Latitude XP through its' paces on their Steeplechase battery life test. The results? Well an amazing 17 hours and 5 minutes - absolutely blitzing the existing records*.

OK, so this was in test conditions and you're probably wondering what you can expect outside of a laboratory. Well as we've said - 8 hours. Which is about what some of the others claim and over double what they really deliver!



As VeriTest said "...the XP's battery life is an order of magnitude ahead of the market".

But we wouldn't recommend that you invest in a new notebook on the strength of the battery alone. That's why you should check out just some of the features listed on the next page. Or call us on the number shown and we'll give you all the amazing performance capabilities you can expect from a Latitude XP.

At Dell we don't believe that such a great product should 'stand alone'. That's why all our world wide award winning sales and service schemes apply to the new Latitude XP notebooks.

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Well all of these are pretty compelling reasons for you to choose a new Dell Latitude XP notebook. But we've yet to play our trump card. Compare our prices and call us.

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All Latitude XP systems feature the latest Intel 486 DX processors.

All XPs include the latest Lithium-Ion battery for the longest life available.

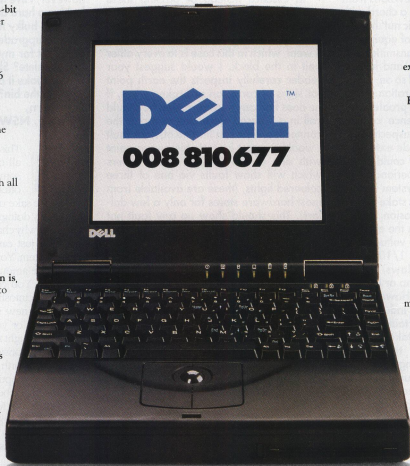
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*The VeriTest Steeplechase test includes mechanical typing, pausing, task switching and printing in MS Windows v3.1, MS Word for Windows v6.0 and MS Excel v5.0. All numbers represent an average of at least two trials with power management function enabled. Test simulates executive usage, ie carrying notebook between meetings and intermittent use. Competitor's times are published in Portable Computing Magazine (U.S.A.). For a complete copy of the VeriTest results call the number shown. Sales tax included. *Delivery not included in price. Prices and specifications are subject to change without notice. On site service warranty may not be available in certain remote areas. The Intel Inside Logo is a trademark of Intel Corporation. Latitude is a trademark of Dell Computer Corporation. **Call Dell for a complete copy of our guarantees.

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HARDWARE

Return of interference...

TIP OF THE MONTH: The reader's question (APC September 1994) of how to cure the interference to radios and televisions from his computer certainly struck a chord with me. I am a bit of an 'electronic nut' having built and repaired a variety of equipment from radios through to transmitters. A friend of mine knowing this and having tried all manner of filters and so on, called me one afternoon in desperation — he was experiencing the same problems as your reader with interference coming through the TV and stereo. Inspecting his setup revealed no home-made extension cords or similar nasties that could cause the interference he was experiencing so we turned to the earthing system for the house. Inspection of the earth stake and its clamp revealed signs of corrosion.

The earth may function in the event of a mains fault because of the voltage and current (up to 100 amps for 1/10th of a second before the fuse blows) which would be high enough to jump or burn its way through the corrosion. However the very small amount of current induced into the circuit by a computer certainly would not. In this case, both the stake and the clamp were so corroded they were replaced, and with their going so did the interference, thus proving our theory. In the reader's situation if the earth connection is faulty he is virtually transmitting, via the common earth wire to all the other units in his block (you will find most blocks of units have one common earth rather

than individual earths), and at quite a strong enough level to induce the noise into the sensitive front ends of both radios and televisions.

In essence instead of passing these spurious emissions to ground, the earth wire would be acting like a huge antenna, happily radiating the emissions wherever it went, which in this case is to every other unit in the block. I would suggest your reader carefully inspects the earth point for signs of corrosion or broken wires, if he does find any such corrosion he should call in a licensed electrician to repair the connection. If he can find no obvious fault I would suggest he tests his power point with one of the Tri-Light outlet testers which will show faults via one of three coloured lights, (these are available from most hardware stores for only a few dollars). This should show up any fault not visually detectable or not at the main earth itself.

**Geoff Salt,
Coburg, Victoria.**



Thanks for the great tip Geoff, I was hoping an electrical expert might come up with a possible solution! This may help a lot of people who are experiencing some kind of interference from their PC. Remember to always use extreme care when handling any electrical equipment and treat every wire as live. If repairs are needed, take Geoff's advice and get a licensed electrician to do the work.

Richard Goulstone

Obsolescence

I have a dilemma. In 1987 I purchased an Apple Macintosh Plus in America. Now, however, I live in Sydney and my system, lacking a hard drive and printer, can only run on a bulky transformer. I desperately need to upgrade, but is there any sort of a market for my little 'foreign' machine? Is it obsolete? Should I toss it in the bin? Should I take it back to America and then toss it in the bin?

**Eric Horn,
Pymble, NSW.**



This is the type of problem that all computer owners will face sometime in their lives. PC users often feel the need to upgrade just for the sake of it. If your current setup is adequately doing everything that you require and want, why change? However in your case you have just cause to want to move to a newer system. You could sell it second-hand, though the amount you received would be negligible. You could try and upgrade your current Macintosh (this will probably cost as much as a new system, especially an IBM compatible) or you could find a computer dealer that might trade it in for you. If money is no object (considering that realistically your system isn't worth much monetarily), then my two favourite options are, keep it and buy a new system, or better yet, buy a new system and donate your Macintosh to a worthy cause (for example, local charity, school, scout group and so on).

Richard Goulstone

OPERATING ENVIRONMENTS

Dates

I have only been using computers for two years and find the date that the computer uses when installing a program back to front for me, such as 09/29/94. Would it be possible to place something in the CONFIG.SYS so that all the dates could be reversed such as 29/09/94?

**Jim Straw,
Mooloolaba, Queensland.**



The default setting on your PC is the United States date format of mm/dd/yy (as in everything else, opposite to the rest of the world). To change to the Australian date format of dd/mm/yy, add the following line to your CONFIG.SYS file:

```
COUNTRY=061, ,C:\DOS\COUNTRY.SYS
```

Substitute the C:\ path to wherever your DOS directory is. The 061 is the code for the International English setting.

If you type HELP COUNTRY at the DOS prompt (DOS 5.0 or higher) then you will see the complete list of codes and date formats for other countries. This line will now change all your DOS programs to the correct date format (once you reboot). To change the Windows date format go into the Program Manager, select 'main', then 'control panel' then 'international', you can now change the date and currency and other country dependent settings to whatever you like.

Richard Goulstone

Incompatibility again...

I have heard of incompatibilities with 32-bit file access and VFAT regarding the use of Windows for Workgroups 3.11 and Norton Desktop 3. In what way would this affect the DOS versions of applications such as SpeedDisk and NDD?

**Tony Parker,
Darwin, NT.**

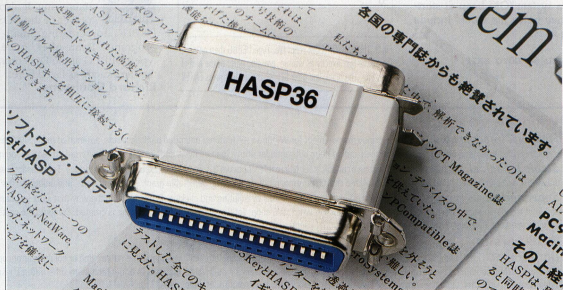


This problem arose earlier in the year and it seems it hasn't been corrected. With 32-bit disk access on, many functions won't work on Norton Desktop 3. The DOS versions, running under DOS will run with no problems, but not under WFW 3.11 with the 32-bit disk access on.

Richard Goulstone

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Gone surfing

BY MICHAEL AITKEN

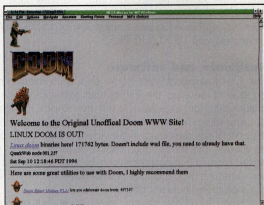
*What's that? I hear you say
that the Internet is for
earnest communication,
research, commerce, and
other serious stuff.*

That's true, but it's not the full story. The Internet is also ideal for exploring, or net surfing. As well as being fun, net surfing is a great way to discover what's out there on the Internet. This month we look at some virtual 'breaks'.

Ask Veronica. Veronica, the global Gopher search facility, is a great way to turn up treasures. You enter search criteria, and Veronica searches and returns all available Gopher menu items that contain the combinations of words that you wanted. It's simple, and very effective.

You can spend hours with Veronica. For movie hounds, the movie database at spinaltap.micro.umn.edu (Gopher, in/fun/movies) or via WWW (Gopher://spinaltap.micro.umn.edu:70/77/fun/Movies) has a searchable database of amateur, though high quality, reviews, and a lot else besides. If you want to do some light reading, a complete (and searchable) Shakespeare is also available at spinaltap. You'll find a collection of Yeats poetry in RTF format at rescomp.stanford.edu.

Search the Microsoft knowledge base via their Gopher (gopher.microsoft.com). It's a lot easier than FTP-ing in — you can find your solution fast through an



A WWW page for Doom fans

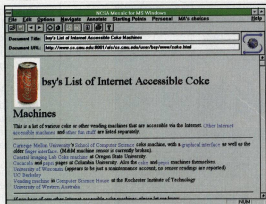
Archie style search of the knowledge base menus.

Telnet to database.carl.org to scan a database that boasts an index of 15,000 journals, with 4000 citations added daily. Searching and browsing titles and abstracts is free. They will fax the articles to you for a fee.

When used with Lynx, or preferably with a graphics-capable client like Mosaic, WWW's point and shoot hypermedia presentation is ideal for net surfing.

Cybersight (<http://cybersight.com/cgi-bin/cs/s?fun.gmml>) offers a confession booth (at <http://another.learning.cs.cmu.edu/priest.html>). You post your confession to selected targets (God is one), and a penance comes back. Among Cybersight's other vital resources is a photo of Elvis with Richard Nixon.

[<http://www.engr.scarsolina.edu/nerd/>] has some handy hooks into home brewing mead and beer (there's a label collection). Or into an unofficial DOOM WWW page. There's a good collection of jokes, culled from news groups. You can drop into O'Reilly's Global Network Navigator. You can cruise into the Digital Drive-in, which talks about multimedia happenings on the Net. There's a weekly feature on digital film makers, and samples of their work. GNN's Net News talks about new Internet services and tools. It has a hook into Pizza Hut's pilot Internet ordering system.



Always... talk to vending machines

Off the wire

BY STEPHEN WITHERS

If all went according to plan, you may no longer have to rely on a telephone connection for your electronic mail and other information services. OzEmail has been developing wireless support for email, Internet access and other services, in conjunction with Telecom's MobileData network. Equipped with a DataPac wireless data modem, your notebook or other portable computer will be able to connect with OzEmail's services. MobileData currently covers much of the Sydney metropolitan area, and base stations have been installed in Melbourne and Brisbane for demonstration purposes. For more information on OzEmail, call (02) 437 5500. For MobileData information, call 1800 636 785.

Hardware and software

Intel, Creative Labs, Hayes, Rockwell and US Robotics are working together to develop the Digital Simultaneous Voice and Data specification for modems. This will standardise modems intended for transmitting digital speech and data across a single phone line in applications such as desktop videoconferencing, regardless of the vendor. The specification should be published this month, and the first product demonstrations should occur by the end of the year. Such products would add a new dimension to the 'chat' facilities found on many multiuser BBSs.

I haven't had the chance to try it yet, but on paper DCA's Crosstalk for Windows with Crossfax sounds pretty useful. The company has taken the well-known Crosstalk and added a graphical Internet Helper and fax software.

The Internet Helper provides point-and-click access to services offered via shell accounts with Internet service providers. Functions supported include email, news, Telnet, FTP, Archie and Gopher. There's no indication whether the software has been customised to provide out-of-the-box support for local providers, or if scripting ability is required to customise the package.

You get Crosstalk with Crossfax for just \$24 more than the cost of Crosstalk alone. The fax software has features that are usually found only in much more expensive packages; these include optical character recognition, automatic handling of incoming data and fax calls, and port sharing to avoid conflicts between the fax and data software.

Crosstalk for Windows with Crossfax is \$219; Crosstalk for Windows is \$195. Upgrades from previous versions cost between \$39 and \$99, depending on versions and whether or not Crossfax is required. Contact DCA on (02) 451 8255.

Online commerce

New South Wales bookseller Mark Owen has given up his shop and has turned to the electronic world to supplement his mail-order business. Felicity Books BBS provides an online catalogue of second-hand books, which Mark updates daily. Orders are accepted via the BBS, phone or mail, and same or next-day dispatch is the proud claim.

Felicity Books runs FirstClass software, and the Mac client software is available on request at no charge. Windows support will be added, along with a faster modem (currently only V.22bis is supported) and longer operating hours. Call the BBS on (049) 40 8579 between 6am and 8pm. Inquiries can be made on (049) 69 4165. If you wish to be notified when Windows access is available, write to PO Box 92, Islington NSW 2296.

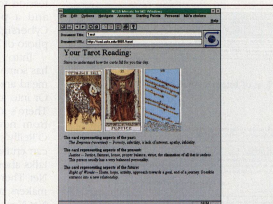
Melbourne-based Shock Records is set to become the first Australian music label to offer artist and product information via the Internet. Future plans include sound samples, biographical notes and tour information. Shock's material will be available through Aussie Music Online, which may also host information from other labels including Larrikin. The service will initially be hosted by a system in the US accessible by Telnet, but a World Wide Web server in Melbourne will go online later. Address details were not available at the time of writing, but the Telnet service should be online by the time you read this.

Turning to international trade, the Global Recycling Network (GRN) exists to find a market for obsolete products and capital equipment, especially in the developing countries. GRN provides an Internet-accessible database that can put sellers in touch with buyers for a nominal fee: a monthly subscription of \$US30 covers unlimited sell or buy requests and unlimited browsing through the database. For more information, contact GRN by email at info@grn.com or call 0011 1 516 286 3681 from a fax and press 'Start' when you hear the tone.

Do some desktop tourism through the Roadside America Hypertext (http://www.wired.com/Hotwir-ed/roadside/index.html). For the project, several camera and computer-laden travellers crossed the USA, uploading text and images nightly. You get to see attractions such as West Virginia's Mummies of the Insane, and Oral Roberts' 40 foot tall Healing Hands sculpture.

"Do not fear your future... take control of your life today...". While you will need "your local psychic" for a full reading, you can get a three-card Tarot reading online at <http://cad.ucla.edu/repository/useful/tarot.html>.

Back in Melbourne, the home page of Latrobe's Glenn College (http://



Have your Tarot read

latrobe.edu.au/GlennHome.html) is a pointer to Jason's Kite Site. There's also an online exhibition from the Latrobe Art Museum.

And check into AARNet (<http://info.aarnet.edu.au:80/aarnet/>) to keep up with access issues regarding your Net.

Ever wondered how to search for WWW pages? Catch ALIWEB at <http://web.nexor.co.uk/aliweb/doc/aliweb.html>. This service is built on searchable indexes to WWW resources. A form-based query returns a page of hypertext links. Another search site is at SUSI (<http://web.nexor.co.uk/susi/susi.html>). This one offers a wide range of form-based searches for people, software and document files, web pages, and reference books.

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APNO 94

NEW Systems

NSW

3-Space (02) 872 4004. P. Daniel Laudams. V.21, V.22, V.22bis, V.23, V.32, V.32bis, V.Fast Class. FidoNet 3:711/946. 24 hours.

Atreides BBS (02) 541 1440. MV. George Stevens. V.22bis, V.32, V.32bis, V.Fast Class. 24 hours.

Emerald Towers (02) 639 5136. P. Garry Fung. V.22bis, V.32, V.32bis. FidoNet 3:713/912. 24 hours.

Falcons BBS (02) 728 3206. M. Adrian Muller. V.21, V.22, V.22bis, V.23, V.32, V.32bis. 6am-8:30pm weekdays, 24 hours weekends.

Knowledge Bridge (02) 413 4651. M. Daren French and Angus McKinnon. V.22bis, V.32, V.32bis, V.Fast Class. FidoNet 3:711/942. 24 hours.

ODIN (02) 456 5143. M. Jim Clark. V.21, V.22, V.22bis, V.23, V.32, V.32bis. 24 hours.

The Evolution (02) 527 1362. MV. Dave. V.21, V.22, V.22bis, V.23, V.32, V.32bis. 24 hours.

All Systems Support (046) 28 6421. P. Paul Hamby. V.22, V.22bis, V.32. FidoNet 3:712/422. 24 hours.

Emerald Solutions BBS (047) 36 5339. P. Bob Rideout. V.21, V.22, V.22bis, V.23, V.32, V.32bis. FidoNet 3:713/322. 24 hours.

Felicity Books (049) 40 8579. M. Mark Owen. V.21, V.22, V.22bis. 6am-8pm daily.

MaGiK-12BBS (049) 45 1001. P. Warlock. V.22bis, V.32, V.32bis, V.Fast Class. 24 hours.

MZK BBS (047) 29 1352. MV. Matt Marlor. V.22, V.22bis, V.32, V.32bis. 8pm-6am daily.

Scotty's BIG RED Bus (067) 62 0241. MV. Eric Scott. V.21, V.22, V.22bis, V.32, HST. GTNet 305/000. 24 hours.

T.I.D.E BBS (065) 53 9256. MV. John Clinch. V.21, V.22, V.22bis, V.23, V.32, V.32bis. 24 hours.

The Blue Satellite (043) 40 4851. MV. Mat Powell. V.22, V.22bis, V.32, V.32bis. FidoNet 3:711/943.2. 24 hours.

WATA BBS (043) 52 2207. MV. David Mott. V.22, V.22bis. FidoNet 3:711/462. 9:30pm-7am daily.

Vic

Captain's Quarters BBS (03) 735 3014. M. Paul Nixon. V.21, V.22, V.22bis, V.23, V.32, V.32bis. FidoNet 3:633/205. 4pm-9am weekdays, 24 hours weekends.

Financial Markets BBS (03) 532 5754. P. Peter Cooney. V.22bis, V.32, V.32bis. 24 hours.

Formosa CBBS (03) 802 1315. P. Roger Chuang. V.32, V.32bis, V.Fast Class. FidoNet 3:633/247. 24 hours.

Get Info (03) 459 4289 Multi-Line. MV.

Stuart Marburg. V.21, V.22, V.22bis, V.23, V.32, V.32bis. 24 hours.

Infinite Wisdom BBS (03) 899 9425. P. DaN The MaN. V.22bis, V.32, V.32bis. 10pm-8am daily.

jeack Internet Access (03) 879 5538. MV. John. V.21, V.22, V.22bis, V.23, V.32, V.32bis. Internet jeack.apana.org.au. 24 hours.

Technofear (03) 844 2904. P. Michael and Christie Redfern. V.21, V.22, V.22bis. 10:30pm-7am daily.

Ten Forward (03) 827 9403. MV. Raphael Segal. V.22bis, V.32, V.32bis. FidoNet 3:632/525.5. 24 hours.

The Reg Dimension (03) 364 2972. MV. Russell Varney. V.22bis, V.32, V.32bis. FidoNet 3:635/740. 24 hours.

The Speed Limit BBS (03) 331 2542 Multi-Line [2]. P. Michael Purdy. V.22bis, V.32, V.32bis, V.Fast Class. 24 hours.

Total Recall (03) 563 5704. P. David Roitman. V.22bis, V.32, V.32bis, V.Fast Class. 10pm-4pm daily.

VIOLENT CRIMES (03) 562 1737. MV. Sud-den Death. V.32, V.32bis. 24 hours.

ACT

CON-X-ION BBS (06) 231 5739 Multi-Line [2]. MV. Chris Annett. V.22, V.22bis, V.32, V.32bis. FidoNet 3:620/256. 24 hours.

PinkBits BBS (06) 286 5510. M. BitMaster. V.32, V.32bis. 24 hours.

Star Trek BBS (06) 299 4003. P. Brian Cheeseman. V.21, V.22, V.22bis, V.32, V.32bis. 24 hours.

Qld

Level Crossing BBS (07) 851 1115. MV. Darryl Cross. V.21, V.22, V.22bis, V.23, V.32, V.32bis. 24 hours.

Programmer's Choice (07) 841 5482. M. Michael Geurtjens. V.32, V.32bis. 8am-10pm daily.

The Red Barren (07) 207 2497. MV. Michael Ballantyne. V.21, V.22, V.22bis, V.23, V.32, V.32bis. 24 hours.

Aust Super Sleuth's BBS (075) 97 0454. P. Perry Mason. V.22bis, V.32, V.32bis, V.Fast Class. 24 hours.

Electronic Waves BBS (079) 78 4712. P. Geoff Doohan. V.21, V.22, V.22bis, V.32, V.32bis. FidoNet 3:640/743. 24 hours.

MegaTech BBS (077) 83 5397. P. David Hockett. V.21, V.22, V.22bis, V.23, V.32, V.32bis. FidoNet 3:640/800. 24 hours.

The Night Owl BBS (077) 75 7464. P. Wayne Dobie. V.22, V.22bis, V.32, V.32bis. 6pm-6am daily.

NT

Alice Connections BBS (089) 52 6870. P. Andrew Hall. V.22bis, V.32, V.32bis, V.Fast Class. FidoNet 3:850/117. 24 hours.

WA

All A Baud On-line Services (09) 310

9222. MV. Ken McKay. V.21, V.22, V.22bis, V.32, V.32bis. FidoNet 3:690/396. 24 hours.

Alphabyte BBS (09) 227 9540. M. Chris Tan. V.21, V.22, V.22bis, V.32, V.32bis. FidoNet 3:690/404. 24 hours.

BayCom Support BBS (09) 535 5473. P. Garry Pusey. V.21, V.22, V.22bis, V.23, V.32, V.32bis. FidoNet 3:690/356. 5pm-8am daily.

Cubeoid BBS (09) 337 5683. P. Alex Polgardy. V.21, V.22, V.22bis, V.23, V.32, V.32bis. 9pm-9am daily.

The Perth PC Users Group BBS (09) 470 5078. MV. Cameron Goodair. V.21, V.22, V.22bis, V.23, V.32, V.32bis. FidoNet 3:690/650. 24 hours.

The Saint BBS (09) 337 4684. P. Mark Haworth. V.21, V.22, V.22bis, V.23, V.32, V.32bis. 24 hours.

Updates

NSW

CompSync BBS Permanently offline.

Destinations Unknown (02) 427 7707. MV. Robin Frousheger. V.22bis, V.32, V.32bis. FidoNet 3:711/459. 24 hours.

Morning Star BBS Permanently offline.

Petticoat Junction (02) 686 4483. P. Denise Cadman. V.32. GTNet 302/028. 24 hours.

The Archeion Amiga Mail Server (02) 949 1224. V. John Paul Lonie. V.21, V.22, V.22bis, V.23, V.32, V.32bis. FidoNet 3:714/908. 24 hours.

The Data Centre (02) 874 0162. MV. Phil- lip Johnston. V.21, V.22, V.22bis, V.23, V.32, V.32bis. 24 hours.

The Poet's Dilemma (02) 686 4476. MV. John Della-Torre. V.32. GTNet 302/000. 24 hours.

The War Room BBS Possibly offline.

WildWest BBS Permanently offline.

AustraliLINK (063) 53 1329. P. Chris Baker. V.21, V.22, V.22bis, V.32, V.32bis. FidoNet 3:623/624. 24 hours.

Bedrock Temporarily offline.

Krikkit One Permanently offline.

MMC-BBS (042) 74 0399. P. Tony Carpenter. V.22, V.22bis, V.32, V.32bis. FidoNet 3:712/640. 9pm-8am daily.

Mr Beans BBS Permanently offline.

Shoalhaven PC Users Group BBS Permanently offline.

The Cabal Connection (044) 72 8236. MV. Ian Hunter. V.22bis, V.32. FidoNet 3:625/100. 24 hours.

The Erotic Emporium See The Cabal Connection.

The Western Connection (067) 67 3018. MV. Tony Prichard. V.21, V.22, V.22bis, V.32. FidoNet 3:622/671. 24 hours.

Wayne's World Permanently offline.

Western District BBS See Austr-
LINK.

Vie

Cloud Nine (03) 886 5195 Multi-Line [2].
MV. Hamish Moffatt. V.22, V.22bis, V.32,
V.32bis, V.Fast Class. FidoNet 3:632/552.
24 hours.

CONNEXUS BBS (03) 894 4400. MV. Greg
Holloway. V.21, V.22, V.22bis, V.23, V.32,
V.32bis, V.Fast Class. FidoNet 3:634/391.
24 hours.

Crack House Permanently offline.

CREST Australia BBS Permanently of-
line.

Datamini Compibus BBS Possibly of-
line.

Doofus Permanently offline.

Euphoria BBS Permanently offline.

FRS Shareware Possibly offline.

Graceline BBS Possibly offline.

Hot Oriental Girls BBS Possibly offline.

Point Blank BBS (03) 898 4892 Multi-Line
[6]. MV. Ahoogah. V.21, V.22, V.22bis,
V.32, V.32bis. 24 hours.

Rogue 2cF25SD Permanently offline.

SoundGarden BBS Permanently offline.

Starlight Salonika BBS Permanently of-
line.

Sunken Treasure BBS See Point Blank
BBS.

The Baudwalk Permanently offline.

The Bridge BBS (03) 686 6107. P. Darren
Merritt and Tony Langdon. V.21, V.22,
V.22bis, V.32, V.32bis. FidoNet 3:632/367.
24 hours.

The Quest BBS Possibly offline.

The Roaring Rapids See CONNEXUS
BBS.

The Witche's Brew Possibly offline.

Vincula BBS Permanently offline.

7th Emulation BBS See Shadow League
BBS.

Cave Woman BBS (054) 60 5768. MV.
Baden and Linda Nunn. V.22, V.22bis,
V.32, V.32bis. 24 hours.

Shadow League BBS (051) 76 1925. P.
Benjamin Kane. V.21, V.22, V.22bis, V.23,
V.32. FidoNet 3:632/327. 24 hours.

ACT

MIDAS-Net : Canberra (06) 239 6920.
MV. Neil McLean. V.21, V.22, V.22bis, V.32.
FidoNet 3:620/253. 24 hours.

The Public BBS Permanently offline.

QLD

Ability BBS Permanently offline.

Active BBS Permanently offline.

Amiga Adventure Permanently offline.

Anton's Place Possibly offline.

Atom BBS Permanently offline.

Black Cat BBS Permanently offline.

Commodore-Amiga Computer Users

Group BBS Permanently offline.

Dead Lites BBS Permanently offline.

EvilDead Possibly offline.

Goodies & Bits Possibly offline.

Leading Edge BBS Permanently offline.

MIDAS-Net Temporarily offline.

Format of listings

Entries in our listings contain the following
information: system name, phone num-
ber, access, operator's name or alias,
supported modem standards, network
node number and hours of operation.

The access code may be P (Public),
M (Members/registered users only), MV
(as M, but with limited Visitor access).
The modem standards are V.21
(300bps), V.22 (1200bps), V.22bis
(2400bps), V.23 (1200/75bps), V.32
(9600bps) and V.32bis (14400bps).
WorldBlazer/TailBlazer, HST,
V.32terbo and V.Fast Class are defacto
high-speed standards.

The four main BBS networks in
Australia are FidoNet, INTnet GNet
and WorldNet. These networks provide
a way of sending public or private mes-
sages between boards, whether they are
in the same suburb or half a world apart.

NiteBreed BBS (07) 892 7278. MV.
Sandmann. V.21, V.22, V.22bis, V.32,
V.32bis, V.Fast Class. AmigaNet
41:400/274. 24 hours.

OS/2 Cellar BBS Permanently offline.

P.R.I.S.M. Temporarily offline.

Proteus Technology (07) 800 3526. MV.
Joseph McKinnon. V.22, V.22bis, V.32,
V.32bis, V.Fast Class. FidoNet 3:640/830.
24 hours.

Sidex Express BBS (07) 805 5928 Multi-
Line. MV. Brendan Pratt. V.21, V.22,
V.22bis, V.32, V.32bis, V.Fast Class. Fido-
Net 3:640/463. 24 hours.

The Data Bite BBS Possibly offline.

The Dream Machine Permanently of-
line.

The GOLD CONNECTION Permanently
offline.

The Sysop Support BBS Permanently of-
line.

The Two Tees BBS Permanently offline.

Time Out! BBS (07) 344 2250 Multi-Line
[2]. MV. Ross Bladin. V.21, V.22, V.22bis,
V.23, V.32, V.32bis. FidoNet 3:640/370. 24
hours.

Weasel's BBS Permanently offline.

Zeros and whunZ Temporarily offline.

**Australian Communications Tech Sup-
port** Permanently offline.

CFM McAfee's — Townsville Perma-
nently offline.

Critical Mass BBS Permanently offline.

Download Unlimited Permanently of-
line.

Logistique Australia (071) 23 1709. P.

Michael Hood. V.21, V.22, V.22bis, V.32,
V.32bis. FidoNet 3:640/383. 24 hours.

Omega BBS (074) 99 9307. MV. Kevin
Nugent. V.21, V.22, V.22bis, V.23, V.32,
V.32bis, V.Fast Class. AmigaNet
41:400/791. 24 hours.

Speed Demon Permanently offline.

The FixX BBS Permanently offline.

The Graveyard Shift BBS Permanently
offline.

The Hard Disk Cafe Possibly offline.

The Rebellion Permanently offline.

The Software Bank Permanently offline.

SA

ADELAIDE DATA EXCHANGE (08) 262
8534. MV. Michael Dolensky. V.22,
V.22bis, V.32, V.32bis, V.Fast Class. Fido-
Net 3:800/875. 24 hours.

Sam's BBS (08) 379 5578. M. Sam Yates.
V.21, V.22, V.22bis, V.23, V.32, V.32bis. 24
hours.

Southern Night BBS Permanently of-
line.

Yatesy's BBS See Sam's BBS.

WA

1994 PC Bits Permanently offline.

Alpha & Omega Permanently offline.

ASIAPAC Network Permanently offline.

Coast To Coast BBS Permanently offline.

COL'S POINT BBS (09) 439 2451. MV.
Colin Langley. V.32bis. FidoNet 3:690/374.
24 hours.

Crossroads Permanently offline.

Dataline BBS (09) 332 3378. M. Kingsley
Faulkner. V.21, V.22, V.22bis, V.23. Fido-
Net 3:690/394. 24 hours.

DataStorm BBS Permanently offline.

InfoCom BBS (09) 244 2924. P. Darren
Lyon. V.21, V.22, V.22bis, V.23, V.32,
V.32bis. FidoNet 3:690/678. 24 hours.

Information Centre of Australia (09) 493
5445 Multi-Line [5]. MV. Glen Tapley. V.21,
V.22, V.22bis, V.23, V.32, V.32bis. FidoNet
3:690/347. 24 hours.

Moonbase Alpha Permanently offline.

The Information Centre See Information
Centre of Australia.

The Matrix BBS (09) 378 3702 Multi-Line
[3]. P. Micheal Keohane. V.21, V.22,
V.22bis, V.32, V.32bis. FidoNet 3:690/402.
24 hours.

The Sentinel BBS Temporarily offline.

ZULU (09) 454 4715. P. Tom Temple. V.21,
V.22, V.22bis, V.23. 24 hours.

PineGap BBS Permanently offline.

Southern Realm (097) 25 1369. V.
Stephen Eaton. V.21, V.22, V.22bis, V.23,
V.32, V.32bis, V.Fast Class. FidoNet
3:690/352. 24 hours.

Tas

The Solar Connection (003) 83 4840
Multi-Line. MV. Viper. V.21, V.22, V.22bis,
V.32, V.32bis, WorldBlazer. FidoNet
3:670/303. 24 hours. ▲

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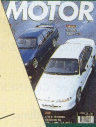
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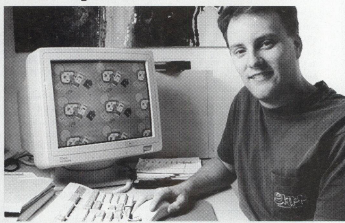


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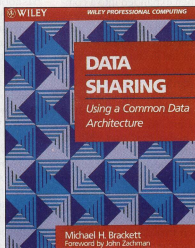
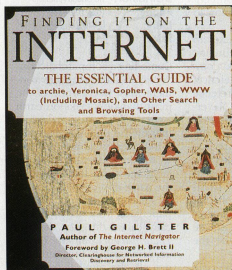
Finding it on the Internet

Author: Paul Gilster
Publisher: John Wiley & Sons
Distributor: Jacaranda Wiley
Phone: (02) 805 1100
ISBN: 0 471 03857 1
(P'back)
Price: \$39.95

A follow up to his earlier volume, *The Internet Navigator*, Gilster has compiled what he calls an 'essential guide' to the major search and browse tools to help you find your way through the Internet. Since there's no central repository for the Internet administration, finding what you want is most often the stumbling block which puts people

off delving in in the first place.

Like *Internet Navigator*, this hefty volume gives Internet novices such as myself much encouragement and is simply and effectively expressed. It explores and explains a plethora of search and browse tools, from Archie and Veronica to Mosaic and the greater World Wide Web. Using a globe motif in place of the ship featured in the previous volume, Gilster sets out many highlighted hints amongst his narrative, thoughts which encapsulate the chapter just read. Rather than try to cover the list of options Gilster explores (because there don't seem to be any left out, though constant evolution ensures that it won't be long before new ones spring up), it's probably more useful to explain that the book focuses, for each of these options, on telling the user what can be found, on how to find it; search restrictions and how to overcome simple recurring



problems. If you're a lone player in this new playground, which is, after all, best explored with a friend who knows the ropes, then this is a great place to start.

Helen Dancer

Data Sharing

Author: Michael H Brackett
Publisher: John Wiley & Sons
Distributor: Jacaranda Wiley
Phone: (02) 805 1100
ISBN: 0 471 30993 1
Price: \$80

Michael Brackett has attempted to dispel many of the myths associated with data architectures in his book *Data Sharing Using a Common Data Architecture*. It is aimed

at anyone who has to deal with the design or implementation of data systems. This covers just about everyone from the MIS manager down to the programming and data collection level.

The book is technical in its content but intelligible to the non-technical reader. According to Brackett you have to go back to basics in order to create a common data architecture. This is exactly what he does in his book. In the opening chapters he sets out to define the different data types and how they relate to each other. The concepts of a shared data vision are then expanded into a common data architecture.

With the definitions and original approach that is taken to data architecture the reader is given not the tools, but the knowledge to approach the problem. With this knowledge in hand it is possible to turn disparate and under-utilised data into a new and efficient resource. The ability to have Just-In-Time data at your fingertips can make a huge impact on efficiency and decrease resource redundancy.

Brackett takes the approach that data is a valuable resource and that it should be treated accordingly.

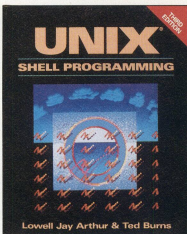
As a text book or constantly used reference, *Data Sharing Using a Common Data Architecture* will provide direction in a field where it is desperately needed.

Stuart Bowman

UNIX Shell Programming - third edition

Author: Lowell Jay Arthur, Ted Burns
Publisher: John Wiley & Sons
Distributor: Jacaranda Wiley
1Phone: (02) 805 1100
ISBN: 0 471 59941 7
Price: \$59.95

Written for those who are interested in more than just dabbling in the Unix environment,



UNIX Shell Programming promises to help the reader to use the power of the shell. Jay Arthur's and Ted Burns' text has about 450 pages, which are divided into three sections: Shell for the novice, for results and — roll the drums, Maestro — for mastery.

The material in this book gently attempts to show the user how to use Unix, beginning by trying to explain the shell, when and why you should use it — one chapter goes so far as to explain to the user how to login to Unix. The material presented should cause few problems for the motivated reader.

The exercises at the end of each chapter are an interesting feature of this book. While this feature is generally a welcome addition, in this book the authors have not supplied any answers. Solutions would have been a welcome inclusion given that this environment can cause great frustration to new users.

This book does not explain — or even attempt to outline — the usage of Unix commands. In the book's defence, it holds absolutely no pretence of being a user manual. Nevertheless, it could certainly do with a few pointers for the reader. Explanations associated with examples are scant although, in the context, they are appropriate. Command usage is not supplied in the examples; the inclusion of at least minimal notes on the topic would have made the going a lot easier.

The book does not become

very complex and is simple for any reader to digest. Somewhat disappointing in its lack of detail, there is absolutely no mention of how to use things such as encryption or decryption. An appendix is devoted to awk, but outside of those tiny 12 pages, there is precious little else about it. Strangely enough, there was a reference appendix section devoted to sed, but little mention of vi.

The full potential of this book can only be achieved when seated at a Unix terminal, simply so that you could get access to an online manual, although most tend to be both unfriendly and unhelpful. If you don't understand a command or concept, it is unlikely that this book will be able to help you. For those users of Unix interested in furthering their knowledge of the shell, this is a worthwhile publication, but add a dictionary of Unix commands to the top of the shopping list.

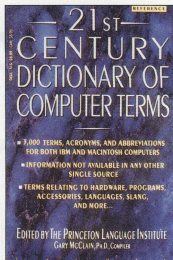
Kenneth Loui

21st Century Dictionary of Computer Terms

Compiled by: Gary McClain, PhD
Edited by: Princeton Language Institute
Publisher: The Philip Lief Group Inc
Distributor: Transworld Publishers
Phone: (02) 908 4366
ISBN: 0 440 21557 9
Price: \$12.95

Compiling a computer dictionary in this evolving environment must rate as one of the most thankless tasks on earth — nothing is more certain than that by the time the print has dried, there will be more buzz words and aberrations of the language as we know it, all in the name of technology.

This cheap and cheerful paperback volume, optimistically called the *21st Century Dictionary of Computer Terms*, explains most, but certainly not all, the familiar terms in



techno talk to date. Focussing on computers rather than the medium in which they operate — for example it lists downtime, but not downsizing — and leaning towards overly simple explanations, it's greatest strength is that it demystifies hundreds of acronyms.

It is a record of the lexicon, rather than the reference work it claims to be — for example it spells out the meaning of CP/M but offers no explanation of its origins or significance. On the other hand it has a valuable cross-referenced index which lists all the words likely to be encountered in several different fields, such as databases and spreadsheets, networking and communications or operating systems.

This is definitely a book for beginners.

Helen Dancer

Developing Lotus Notes Applications

Author: Carolyn Kraut
Publisher: John Wiley & Sons
Distributor: Jacaranda Wiley
Phone: (02) 805 1100
ISBN: 0 471 00861 3
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There is no doubt that the combination of functionality and ease of use makes Lotus Notes one of the most powerful workgroup tools in existence.



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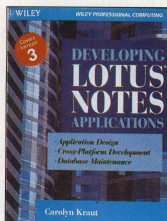
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The result: those with the ability to implement Notes solutions are in demand.

It is not surprising therefore to see a number of texts covering the development of Notes applications on the bookshelves. One of these, *Developing Lotus Notes Applications*, is for those who have little or no experience with Notes. In this book, the author Carolyn Kraut promises a 'clear strategy' for the development of applications.

Forms, views and macros — the bones of a Notes application — are thoroughly described and much time is spent outlining the planning process critical to database design. Explanations throughout the text are tied into the author's example application — a personnel database. In the second and third sections of the book, the topics of On-Line Help, database security and database installation are dealt with extensively.

The final section — one third of the book in size — provides both descriptions and explanations of @functions and @commands. Each function type — mathematical, time/date and so on — is listed, explained and placed in syntax. This section is ordered on type and, while it would be useful to have a purely alphabetical glossary of commands, this method, combined with the comprehensive index that not only lists topics and keywords but includes @functions, makes the section a very acceptable reference. This is especially true for new Notes

developers who probably aren't sure of specific function names.

Unfortunately, while this book contains a wealth of information, the book is poorly structured.

Aside from these criticisms, this text provides a tool that, with a little effort, can be used to effectively learn about Notes development.

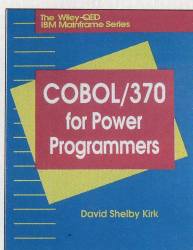
Ben Gerholt

Cobol/370 for Power Programmers

Author: David Shelby Kirk
Publisher: John Wiley & Sons
Distributor: Jacaranda Wiley
Phone: (02) 805 1100
ISBN: 0 471 62367 9
Price: \$75.95

So many people keep telling me how COBOL is a dead or useless language, but the books still keep coming out. This is the second edition of this book written specifically for the latest version of COBOL. COBOL/370 for Power Programmers is certainly not one of those books that you can read once and walk away from. It doesn't leave you confident that you have learnt all that you can from the book in one reading. Very much a reference book, it attempts to cover a great deal of relatively new material in under 400 pages.

The book begins with an introduction to COBOL II and COBOL/370 and then explains the major features of these two versions. A great deal of space is spent highlighting the major differences between coding in COBOL II, COBOL/370 and OVS COBOL. From here, the author continues on to cover programming styles, debugging techniques and design guidelines. The material covered is done in reasonable detail, but there is also a significant amount of assumed knowledge. Obviously targeted at people who already know how to program in COBOL, but who wish to take



their program development abilities to a higher plane.

There are quite a few handy diagrams, and the author has also included a small selection of examples at the end of the book. These have been presented in a relatively simple and straightforward manner. There is also a chapter on summaries, tables and references, which is very well organised.

At the end of each chapter, the author comments on the chapter, selectively re-emphasising points of importance just covered. There is a significant amount of information enclosed in this book, but coming to grips with it all would require a significant amount of work. COBOL may be old, but this book shows that it still has a significant future.

Kenneth Loui

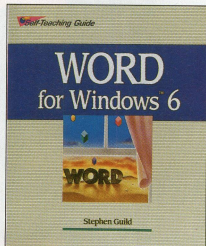
Word For Windows 6

Author: Stephen Guild
Publisher: John Wiley & Sons
Distributor: Jacaranda Wiley
Phone: (02) 805 1100
ISBN: 0 471 30467 0
Price: \$45.95

How many times have you bought software that comes with technical manuals that could only be described as,

well, technical? Enter the self-teaching guide. Designed for the software user who wants to learn how, not why, *Word For Windows 6* is a self-teaching guide that is useful as both a tutorial and a reference book. It treats the reader as someone who is computer literate and intelligent, yet doesn't get too complicated in its approach. It is well set out with self-checking exercises and useful tips throughout the book, as well as summaries and practice exercises.

For those readers who aren't familiar with previous versions of MS Word, there are two chapters covering the basics of word processing and file management. The guide, however, goes much further down the evolutionary path of Word for Windows and covers topics such as its ability to handle graphics, tables, fields, and a myriad of other topics that make the software much more than just a word processor.



My only criticism of the author's approach is the use of exercises for the reader. Some readers may find it difficult to create their own examples when asked, as often there are no specific examples to follow, only general directions. Personally, I prefer this approach, as I can create examples that are relevant to my own needs. I guess I like a book that treats me, the reader, as intelligent.

Paul Gasper

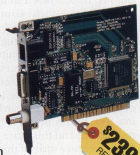
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Inherit the Earth

BY ADAM MACEWEN

OK. You've played adventure games until your eyes popped out, you've been a Fighter or a Paladin or, my favourite, a Wizard or 'Magic-User'

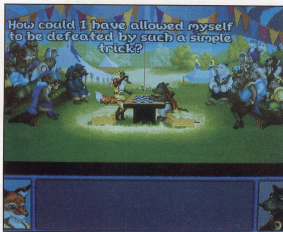
You've hacked and slashed your way across a variety of strange and beautiful alien worlds, unravelled the threads of a hundred devilish and convoluted plots and defeated a plethora of evil superbeings. Now it's time to return to our pastel-hued planet and take a slightly more terrestrial view of things.

The time is, well, somewhere vaguely in the future. The golden age of the Earth has passed, and Humanity has faded into memory. The world is now left in the hands of a (somewhat over-cute) selection of forest creatures who wander haphazardly in tribes across the globe. You play Rif, a suitably sneaky Fox who, after winning second prize at the great puzzle contest, is accused of stealing the precious Orb of Storms, a device capable of predicting the weather. Protesting your innocence, you are (astoundingly) charged with solving the puzzle of the Orb's theft and returning the artefact to the authorities. To make sure that you don't succumb to the temptation of running away and forgetting all about it, your



girlfriend is taken hostage and two significantly larger woodland creatures (a Boar and an Elk) are assigned to your party and instructed to ensure your return, Orb or no Orb.

Inherit The Earth plays more like an interactive movie than an adventure game. This is true of many recent games, but ITE makes this a little more obvious than most, with some fairly long animated sequences and several lengthy conversations with other characters in which you have absolutely no control. There is a feeling, as you wander through the game, that any choice you make has been anticipated. There is no way to fail or 'die' in ITE and this can be very frustrating. The player in effect becomes a little redundant, and this more or less quashes the 'adventure' side of things. Additionally, the characters are a little too cute and cuddly, they disdain (although they constantly refer to) any form of combat and, although the very Reverend Fred Nile may disagree, personally I find that this takes away a lot of the excitement of the



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regular adventure game format (and considering the plot environment, a near medieval society run by animals, it is downright unrealistic).

However, as an interactive movie it is certainly visually attractive. It has dozens of beautifully drawn, almost cinematic, scenes that give an effective impression of depth as characters shrink when they recede into the distance or loom into the foreground of a scene, and multiple 3D maps that scroll very smoothly. The music and the sound effects are also quite impressive and the CD-ROM version of the game has full digitised speech throughout.

ITE is probably meant for a younger audience than the majority of adventure games. It has a very simple and easy to use point and click interface, no violence, and is competitively priced. But don't be put off, the game is very pretty and there are dozens of fairly easy puzzles to solve, just don't expect to spend nights on end scratching your head and wishing for a clue book.

Delta V

Delta V comes loaded with 'Best Of' awards from all over the shop, and a reputation for being incredibly fast. Fast Delta V certainly is, but several days' play still left me unsure as to whether the in-your-face graphics and extra hard gameplay had really translated into an enjoyable and addictive game.

The plot cast me as a Netrunner, a cyberspace hacker in the tradition of William Gibson. While zooming along the net and hacking into some corporate ICE (Intrusion Countermeasures Electronics) I am hijacked by the Black Sun corporation and given the choice of working for them or having my consciousness annihilated. I chose the former option. My job was to run errands across the net, picking up information or terminating targets as I skimmed the



BRIDGE OLYMPIAD

Distributor: Directsoft
Phone: (02) 489 7853
Price: \$69.95

Bridge, is a very complex and very social card game. One that you might think is not an obvious choice for a computer game, given its social nature and that to play it you must have a partner as well as an opposing team. Bridge Olympiad is perhaps an effort to meet that challenge.

The box describes Bridge Olympiad as "the world's finest computer bridge game", and although this claim may be spurious, it certainly is very quick and easy to learn to play. The game has three sections. There is a practice room, where you can play a single rubber match or you can enter into the 'Bridge Olympiad' competition with

eight other teams. The practice room section, along with the game manual, guides beginners through each step of the game including bidding and scoring and has a very helpful 'Tutor' mode, which offers onscreen help and hints throughout game play.

You can also choose from a stable of 12 partners/opponents who come pre-packaged with their own strengths and weaknesses and a very attractive (occasionally) head and shoulders shot.

In short, although the traditional 'social outing' aspect is missing, Bridge Olympiad plays Bridge very well.

So, if you have always wanted to learn Bridge or wondered what all the excitement was about, and can afford \$69.95, Bridge Olympiad is an ideal way to start.

Adam MacEwen



GlobalNet lattice. Each mission carries its own award wages for completion plus bonuses for speed and extra kills.

And so I began. In the office of my boss, Bosco Tasman, I had the choice of going for a simulation practice run, saving the game, hearing Bosco describe the run to me, or doing the run itself. I jumped straight in. After a description of the mission objectives, including visuals of the target, and a rundown of armaments (later I could outfit my craft with new items, if I had the money!) I was away!

I zoomed along the smooth scrolling trench, dodging a variety of architecture and shooting at the ICE guardians who, of course, shoot back. There are several different gauges aboard the craft. The closer I flew to the surface of the trench, the faster I went, but the hotter my hull became; too hot, and I took damage. The most damage was caused by running into the mines laid

randomly and hitting the trench wall. After a while the target came into view and, more by luck than skill, I captured it. Victorious, I was hoisted out of cyberspace to be paid! And so it went for the next seven missions.

I found several difficulties with the game. Things get very hard quite quickly, and a lot of the obstacles are almost impos-

sible to avoid, given their random placement each time a mission is started. Combining with this was the fact that new weapons and items can only be bought with more money, and after seven successful missions, I found my bank account going *down* for some reason! These errors of judgement on the part of the game's designers caused frustration, and a lack of interest in the game. There isn't a huge amount of variety in the missions either. Delta V is good looking, but I don't think I'd want to have a serious relationship with it. Try before you buy.

Nat Tunbridge

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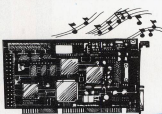
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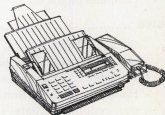
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Need a first (or second) computer? Don't disregard buying a pre-loved model, if not for the system, then for the parts.



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Modem Superstore - Melbourne

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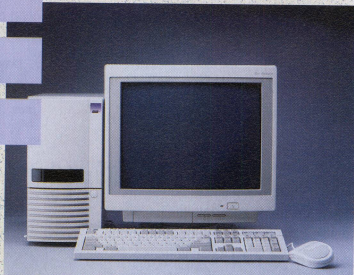
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MOTHERBOARDS Motherboards with CPU

5 Year Warranty

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5 Year Warranty

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Western Digital 90C33 1 Mb VESA	149.00
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5 Year Warranty

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486SX-25 Intel	104.00
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486DX-33 Cyrix	221.00
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486DX-40 AMD	229.00
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486DX-2/66 Intel Over Drive	320.00
486DX-2/66 Intel	395.00
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486DX-4/100 Intel	995.00
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5 Year Warranty

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1x32x70 - 4Mb H. D. 70ns	249.00
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300VA (1 PC, 5-15 min back up).....	299.00
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Mini Tower, LED & 200W PSU.....	75.00
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SlimLine, LED & 200W PSU.....	105.00
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Call today for information on our wide range of Canon and Epson printers.

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Conner 810Mb 12ms, 256k cache.....	820.00
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14" MAXCOM SYGA Colour-0.28 DPI.....	349.00
Feature full screen control and pin cushion adj	
Call for pricing on 15, 17 and 21".	

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MS DOS 6.2 + M/S Win 3.11 for WFG.....	180.00

Call for pricing on installing Novell Networks in your office.

MULTIMEDIA

Why not add a Multi Media Kit? Make your Maxcom computer come to life with the latest in Multi Media Technology. By installing a Multi Media Kit you can enjoy the latest in rap, rock or classical music, view the world through the World Atlas or even learn to type!

CD8 Discovery Kit.....	430.00
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CD16 Game Blaster Kit.....	600.00
CD16 Education Kit.....	699.00
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Sound Blaster Pro Value Edition.....	135.00
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Panasonic CD ROM CR 562.....	278.00
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DOUBLE SPEED & PHOTO CD.....	
"Power Beat" Speakers.....	39.00
Maxcom Multi Media Kit,	
Double Speed CD ROM (Philips).....	295.00
16 Bit Stereo Multi CD Sound Card,	
Amplified Speakers.	

CD TITLES

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Iron Helix.....	G 39.00
Journeyman Project.....	G 44.00
Just Grandma & Me.....	EG 29.00
Kings Quest VI.....	FG 30.00
Kodak Photo CD.....	R 24.00
Lawnmower Man.....	FG 30.00
Links.....	G 40.00
Mad Dog McCree.....	AG 38.00
Mario Is Missing.....	CG 29.00
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Sing Along for Children.....	CM 24.00
The 7th Guest.....	FG 36.00
The Animals - San Diego Zoo.....	R 24.00
Wolf 3 D Mania.....	AG 21.00
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KEY: G - Game R - Reference C - Children E - Educational
M - Music A - Arcade F - Fantasy/Adventure S - Simulator

CONVENIENT FAST SERVICE

With offices in all mainland states Maxcom Computers are able to offer unmatched convenience and service. You can look before you buy and have the warranty carried locally. We have been in business for over 12 years so you can buy with the confidence knowing your warranty is worth something.

Quality Tested Components — Computers vary in price. One reason is consistency of components.

At MaxCom Computers we buy consistent high quality components from quality manufacturers. Many other companies use obsolete, bankrupt or even faulty components to cut a cheap price. This results in faults that can occur in one computer and not another. Buy MaxCom and your overall cost of ownership is much less.

Specifications, contents, pricing and availability subject to change at any time without prior notice. All Prices include sales tax but exclude delivery charges. Warranty return to base. Payment by Mastercard, VISA, Bank cheque or Direct deposit.

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Top Features

NOTEBOOK 9200 SERIES

There's top value buying in the fully featured Notebook Series 9200 range from Micro-Pro. These state-of-the-art Notebooks offer something for everyone from the entry-level unit with a 486SX 25/33 MHz processor through to the blazing fast unit with a powerful 486DX4 75/100 processor. The Easy docking station provides users with quick desktop connectivity to input/output ports. The VESA docking station provides users with a full-powered VESA desktop system including attachment to a wide range of peripherals. A PCMCIA type 4 expansion slot is provided which can

take a type II & type III card, or two type II cards, simultaneously. The 2.5in hard disk is removeable for easy carrying and replacing as well as for data security.

Internal LCD and/or external CRT is featured to display up to 256 colours or 64 greyscales at up to 1024 x 768 resolution.

An audio system has functions for play and record by internal speaker and microphone or external units, making it ready for today's multi media applications.

Two internal, rechargeable NiMH battery packs can be swapped even when the system is switched on and provide power for up to three hours continuous operation.



SPECIFICATIONS

CPU (one of the following)

- 486SX-25/33 MHz
- 486DX 33 MHz
- 486DX2-50/66 MHz
- 486DX4-75/100 MHz

BIOS

- 128KB flash ROM
- Award BIOS

MEMORY

- 4MB DRAM on board MAX 36 MB
- Optional 128KB secondary cache memory
- Optional DRAM module 4/8/12/16/32MB

DISK DRIVES

- Removable 2.5IN 120/200/250/340/500MB HDD also now available 810MB HDD

FLOPPY

- Built-in 3.5IN 1.44 MB HDD

DISPLAY

- TFT/Dual scan STN/Mono
- 1MB display RAM
- Digital controlled brightness & contrast
- LCD - 640 x 480 256 colors or 64 grays
- CRT - 1024 x 768 256 colors
- SimulSCAN

KEYBOARD

- Detachable, 86-key keyboard

AUDIO

- Microsoft 16 bit sound system, Sound-blaster compatible
- Built-in microphone
- Built-in speaker

INTERFACE

- Built-in 250 Track Ball (PS/2 type)
- PCMCIA Type IV expansion slot (one type III slot and one type II slot)
- One line-in jack
- One line-out jack
- One microphone jack
- One serial port
- One parallel port (ECP, EPP optional)
- External VGA port
- External keyboard/keypad port
- 200-pin connector for Docking Station

POWER SYSTEM

- Intelligent Power Management System
- Auto-switching AC adaptor
- Rechargeable NiMH battery packs
- Battery life: Color: 2 hours Mono: 3 hours
- Car adaptor (optional)
- Battery Charger (optional)

PHYSICAL

- Mono: 280mm(w) x 220mm(d) x 50mm(h)
- Color: 280mm(w) x 220mm(d) x 54mm(h)
- Weight: 3Kg (6.6lbs)



Micro-Pro Computers Pty Ltd

SYDNEY - Building 1,106 Old Pittwater Road, Brookvale NSW 2100 FAX (02) 907 1233

MELBOURNE - 46 Downing Street, Oakleigh VIC 3166 FAX (03) 568 2229

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FROM MICRO-PRO

VESA DOCKING STATION

EXPANSION SLOTS

- Four full-size 16-bit ISA bus slots
- Two 32-bit VESA local bus slots

BAYS

- One 5.25" drive bay
- One 3.5" drive bay

INTERFACE

- Two serial ports
- One parallel port
- External keyboard/keypad port
- External VGA port
- Two internal speakers
- R/L Line in jacks
- AT-BUS CD ROM port

PHYSICAL

- 370mm(w) x 367mm(d) x 126mm(h)

EASY DOCKING STATION

INTERFACE

- Two serial ports
- One parallel port
- External VGA port
- External keyboard/keypad port
- One line-out jack
- AT-BUS CD-ROM port

PHYSICAL

- 182mm(w) x 93mm(d) x 48mm(h)



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BEST BUYS

Helpline

Helpline has been set up to provide a service for PC SuperMarket readers and also as a forum for feedback. If you have trouble locating a specific product, write to PC SuperMarket Helpline, Level 6, 54 Park Street, Sydney 2000 or fax your request to us on (02) 267 4909. Please include the name of the product or manufacturer and also your phone number. We will be in contact as soon as we can.

Please be aware that this service is not a direct phone inquiry service, nor do we recommend products or diagnose computer ills through the mail or by phone.

APC reserves the right to publish any correspondence addressed to Helpline.



I have been asked to supply along with other equipment a 'Gridmaster PC Mat'. It is 30 by 45cm and I believe it was marketed in Sydney by a company called Numonics. I have been unable to locate either the mat or the supplier. Is it possible you can shed some light on my problem?

Stewart Masters

Numonics is the actual manufacturer of the product described and is a US company. Numonics' products are distributed in Australia by Polaroid Computing which can be contacted on (02) 950 7060.



I would like to know if and where it is possible to get a BBS (private or public) directory together with the BBSs' specifications, or special fields if any.

Currently, I am looking for a BBS to connect to and get the fruit and vegetable market prices, but I would be interested in downloading weather data, exchange rates or other information.

Jean-Philippe Oggier

APC runs a listing of BBS in the After Hours Communications section. These listings are provided by the Australian BBS Registry, which may be able to help you. It can be contacted by writing to Rodney Creer, PO Box 731, Penrith, NSW 2751.

Helpline would suggest that the information you are looking for may be available from the better known online services such as CompuServe.



About 14 months ago I purchased a Texel Corp CD-ROM drive Model DM-3024. The unit requires servicing and the firm which I purchased it from has disappeared. Is there a local agent or service facility I could try?

Robert White

Texel products are now marketed under the Plextor name. The distributor of Plextor CD-ROM drives in Australia is SCSI Corporation, which can be contacted on (02) 894 6033.

Can you help?



I am looking for a couple of TOPS Flash Cards and TOPS teleconnectors to set up a small LAN. I have contacted half a dozen computer stores without any success. I hope that you or any readers of your magazine may be able to help.

Minh Nguyen

We believe the TOPS products you refer to were once distributed by Sun Microsystems. However, we have no record of a current distributor.



I am trying to find the supplier for Electronic Paper, an online documentation software product developed in

the USA.

Colin Asimus



I have inherited a NEC Powermate SX Plus (386), several years old, which unfortunately only has 1M of memory.

I have been told that memory modules are no longer produced for this model.

As it will need more than this to run my current software, I would welcome any suggestions to increase memory.

John Savage



I am trying to locate the importer/distributor for Gigabyte motherboards. Would you

know who it is?

Sam Yates

IBM cAptivates consumer marketplace

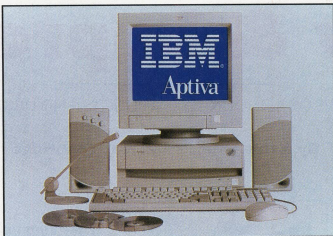
BEST BUYS

IBM has unveiled its latest tilt at the home market, the Aptiva range. Starting at around \$2499, there are seven models in the series available in the US. At the time of going to press IBM in Australia had not decided which of the models it would introduce in Australia, but according to brand manager, consumer products, Paul O'Neil, several of the seven will be represented, and the range will include entry-level 486SX models up to a 486DX2 or even a Pentium.

Countering the notion that the Aptivas had been introduced as a direct response to the Presario range from Compaq, Mr O'Neil said "Aptiva is IBM's way of making itself competitive in the consumer marketplace. That means that we are targeting the whole market, not just one competitor, but yes, Presario will be one of them".

The Aptivas released in the US have a range of communications options such as fax modems, which will not be available in Australia with the original release. The process of homologation (obtaining Austel approval) has relegated this option to the too hard basket for the present, but Mr O'Neil says that discussions are underway to ensure that full communications can be added to the range as soon as possible.

Extensive help facilities are available, such as the on-site extended warranty and 24 hours a day online help, as well as Aptivaware, familiar to PS/1 users as the PS Tutorial. Aptivas will come with a full range of preloaded soft-



The IBM Aptiva personal computer

ware, including DOS, Windows, and PFS WindowWorks, featuring spreadsheet, database and word processing packages.

For more information, contact IBM Direct on 008 815 154.

Helen Dancer

Harvey Norman expands, Brashes bounces back

The irrepressible Gerry Harvey of Harvey Norman fame is on the move, planning new HN Computer Superstores in Victoria, and then further west.

Three stores in Victoria, at Nunawading, Dandenong and Ballarat opened during October, and Mr Harvey has set a course for rapid expansion. It seems that he is planning to be as ubiquitous as McDonald's — Mr Harvey estimates that there will be a HN Com-

puter Superstore in every Victorian town of more than 15,000 people over 'the next year or two'. The following year plans will get underway for stores in South and Western Australia.

With the financial crumbling of the Brashes empire in June it might have been easy

to suppose that Harvey Norman might have had a free run, but an injection of Singaporean funds has seen the start of a new, revitalised, refocused Brashes enterprise which looks set to give the Superstore chain a run for its money.

Smart investor Ong Beng Seng bought the assets of the company when it was placed in involuntary administration, reputedly sinking \$20 million into refurbishing and remarketing Brashes stores with the usual music lines and top name brand computers and related products. White goods, the company says, are out, and the focus is PC technology, communications and entertainment. It's a new product range but the same look and feel is the order of the day, according to Australian managing director Adrian Kloeden.

Helen Dancer

Bargain corner

Compaq Computer has announced price cuts of up to 22 per cent across its range of desktop PCs. Examples of the price cuts include the Prolinea MT 4/66 M340, which now sells for \$3109 — a saving of \$868, and the Deskpro XL 450 M270, which now sells for \$4555 — a saving of \$581. The Compaq Contura Aero subnotebook family of computers has also been reduced in price with cuts of between 19 to 35 per cent. Contact Compaq on 1 800 060 800.

Digital Equipment Corporation has also reduced prices on its entire line of desktop PCs, including the LPv+ and LPx+ by 17 per cent. Digital PCs are now available from \$2370. Contact Digital Equipment Corporation on 1 800 021 246.

With the purchase of PC Tools for Windows, **Symantec** and **Merisel** are offering a free copy of the popular Simpsons Screen Saver. PC Tools will be offered at a special price of \$215. The overall savings on the combined package is \$120. The offer is available until November 30 and will be available through major computer retailers and resellers.

**BEST
BUYS**

New & Improved

NEWS OF ANNOUNCED PRODUCTS AND UPGRADES

By Ashlea Miller and Nat Tunbridge

NEW

Sprinter carries the flag for Promise

PC peripheral distributor Sprinter has been appointed Australian distributor for Promise Technology, the storage specialist, which has just announced its new EIDE 2300plus enhanced IDE controller for the VESA local bus. The new controller card manages up to four IDE devices (two EIDE devices) and provides a full set of high speed serial ports, enhanced parallel port and games port. The 2300plus retails for \$109.

Contact Sprinter on (02) 938 3388.

NEW

When a spreadsheet isn't enough

Software Publishing Corporation (SPC) has released Harvard ChartXL, a sophisticated Microsoft Windows-based data charting application that enables spreadsheets to be used more effectively. This product is for professionals who need a tool to visually analyse, manipulate and present critical business, finan-



cial, statistical or technical data. Harvard ChartXL integrates with existing Windows applications, including spreadsheets, word processors, and page layout and presentation graphics packages.

Harvard ChartXL costs \$195. Contact Merisel on (02) 697 8666.



NEW

Relying on your secretary

The SmartModem V8 (\$999) and V6 (\$599) are at the heart of the NetComm Electronic Secretary

range. The Electronic Secretary is an integral part of the 'Cooe' communications manager. It is an integrated Windows-based communications program that seamlessly accepts voice, fax and data messages and forwards them as required. It communicates with the user in a number of different ways,

such as ringing the Hutchison paging service; ringing a pre-programmed phone number; or deferring to the paging service if there is no response from a mobile. The Electronic Secretary is a necessity for individuals

who need to keep in touch with the office.

Contact NetComm on (02) 888 5533 for more information.

IMPROVED

Brother's low-cost laser printer

The new Brother HL-631 is a fully featured laser printer with a price of \$999. The HL-631 has unique features which include interface switching—escaping the tedious manual changeovers, and also a highly enhanced memory management. It is the only low-end laser printer that features a straight-through paper path using Brother's 'Paper Glide Technology', an opti-



vised Windows 3.1 driver, high-speed bidirectional parallel port, 45 fonts, two button control and the Microfine toner. The HL-631 has US Energy Star approval.

Contact Brother on (02) 887 4344 for more details.

NEW

An eye for storage

Hitachi has released a 2G optical disk drive on a 5.25in disk, the Hitachi OD152. The drive offers a cost of \$2.65 per megabyte and provides an average access time of 40ms with an average transfer rate of 3Mbps using an embedded SCSI-2 interface.

The OD152 will supersede all storage options available in the market, in terms of rewritable optical media", according to the managing director of DCS, Mr Colin Westbury.

The OD152 is available through selected resellers with a list price of \$4990. For further information contact DCS Australasia on (03) 878 0344.

NEW

Calling all Cecil B. De Milles

Multimedia distributor Lako Vision has announced it is distributing products from German manufacturer miro Computer Products.

These products include

the miroVideo DC1-tv, which is an ISA bus board that allows the user to record video at 25fps to the hard drive, edit the footage and record it back to video using a built-in video output module. The board comes with U-Leads' VideoStudio software and works on any 486 computer.

The miroVideo DC1-tv package costs \$1990 and is available from Lako Vision, which can be contacted on (03) 525 3899.

IMPROVED

Gold, gold, gold

Symantec, which recently acquired Central Point Software, has announced the release of XTreeGold 4.0 for Windows. The product features keystroke and feature compatibility with XTreeGold for DOS; Chicago-readiness with support for long filenames; new viewers for MS Word 6.0, Excel 5.0, Lotus 1-2-3 V4.0, AutoCAD and JPEG; expanded PKZip support and selecting files across directories or drives.

XTreeGold 4.0 for Windows is priced at \$165. Upgrades are available for \$85 (plus shipping costs) by calling 008 810 101. For more details contact Symantec on (02) 879 6577.

NEW

A step further in accounting

Specialist Australian software house, Sybiz, has released Sybiz Vision — an all-new accounting solution. Although it runs under Windows, it is different from the other Sybiz Windows accounting packages. The open architecture



design can be very easily tailored to suit most business operations. Tools are provided to customise the information stored, for example forms and reports. The package integrates with software written in Microsoft Access, Visual Basic and other popular languages.

For further information, contact Sybiz Software on (02) 954 5211.

NEW

Take note!

The NoteMaster 486P family from Samsung offers a large range of configurations with two types of screens, passive colour LCD dual scan STN or an active matrix colour TFT, and a choice of processors, the SL Enhanced SX/33, DX4/75 and DX4/100. The notebooks include a sophisticated hibernation management system with five separate status levels to provide up to 3.5 hours of battery operation.

ing time. It also includes two PCMCIA slots.

Prices start at \$4789 for a SX/33 notebook with 200M hard disk and passive colour screen. Contact Samsung Electronics on (02) 638 5200 for more details.

NEW

Scanning Oce-Australia

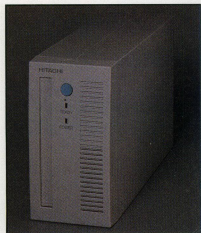
Oce-Australia has introduced a new range of high speed, high resolution flexible scanners. The G6000-S range comprises three AO/E monochrome scanners, delivering high quality raster images with reliable reproduction of information. The \$17,500 G6015-S is designed for scanning simple drawings, while the \$21,000 G6035-S has a 500dpi resolution and is dedicated to fast scanning of drawings for archiving applications or for conversion into mechanical and AEC applications. At 800dpi, the \$27,950 G6045-S is suited to GIS and mapping applications where drawings contain lines which are dense and fine.

Contact Oce-Australia on (03) 263 3333.

NEW

Switching to GCS

Graphics Computer Systems has announced the SCSI Switch, Model ACI-2014 which offers both local and remote switching of multiple SCSI computer and peripheral buses. The switch is supplied with Windows, Macintosh and Unix software to control selection via a standard RS-232 computer port. This means expensive peripherals can be shared between different computers without reconfiguring cables or bus terminators.



BEST BUYS



It supports standard 8-bit (wide) SCSI devices and enables disks, imaging cameras, page scanners, RAID arrays, tape back-up systems and CD-ROMs on six independent SCSI buses to be connected and exchanged electronically.

Prices start at \$3700. Contact Graphics Computer Systems on (03) 888 8522.

NEW

Printers with class

Hewlett-Packard has introduced a new class of work-group laser printers: the HP LaserJet 4V (for Windows and DOS PC workgroups) and HP LaserJet 4MV (for Windows, DOS, Macintosh, Unix and networked PC environments) feature HP's most advanced networking capabilities,

600 by 600 dots-per-inch (dpi) print resolution and accommodate printing on a range of paper sizes, including A4, letter, legal and A3.

They also are the first HP printers to offer an internal hard disk option.

The new work-group laser printer provides 16ppm engine speed for letter, A4, legal and executive paper sizes, and 9ppm for A3. It features a 33MHz Intel i80960 CF RISC processor, the fastest offered in an HP LaserJet printer and optimised PCL drivers and firmware for faster PCL printing.

The LaserJet 4V costs \$4376 and the 4MV is price at \$6205. For information on the HP printers, contact Hewlett-Packard on 131 347.

NEW

Compaq adding another to the family

Compaq has announced the new Compaq Contura 400 family of notebook computers. The Contura 400 is a refinement of the successful Contura product with advances in ergonomic design, upgradeability and functionality.

The new family includes two monochrome models and a choice of two 486DX2/40-based colour models — one with an active-matrix display and the other with advanced passive-matrix.

Prices range from \$3511 to \$6347. Contact Compaq Computer on 1 800 060 800.

high-performance needs typical of a wide range of businesses.

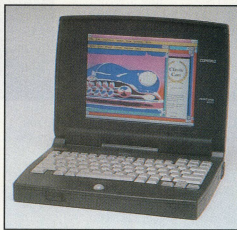
The Manhattan P5090

models range in price from \$10,300 to \$17,268. A sample model including 1G FastSCSI hard drive, PCI-based dual-channel FastSCSI II disk controller, CD-ROM, Pentium 90MHz CPU, 256K second-level cache and 16M memory costs

\$12,628. The

Manhattan V5090 costs approximately \$2400 less.

For more information contact AST on (02) 415 5400.



NEW

AST's Manhattan

In a move to support the networking market, AST has announced an all new server line, the Pentium-based, dual-processing-capable Manhattan V and P series. The new models replace AST's Premia SE line. The Manhattan P5090 is designed for users who need the power and fault-tolerant features of enterprise wide computing. The V5090 is for the more cost-conscious buyer, with the

NEW

Going to the movies

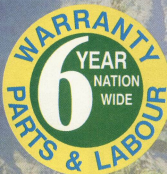
The Movie Machine line of products manufactured by FAST Electronics in Germany provides capabilities for the consumer as well as multimedia developer. It has facilities such as cable-ready TV, Teletext to ASCII conversion, dual layer PAL or NTSC Genlock with digital effects such as picture in picture, AB

'push-over', graphics overlay and chroma and luma keying.

It has an optional motion MJPEG compression engine with selectable compression ratios for 19:1 to 100:1, image sizing up to full PAL of 780 by 568 pixels and 25 frames per second. It is MS-Windows compatible, and supports MCI commands.

Prices range from \$599 to \$2750. Contact Megavision on (02) 699 1488.▲





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Pentium Multimedia

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- SpeedPro VLB Hard Drive Accelerator
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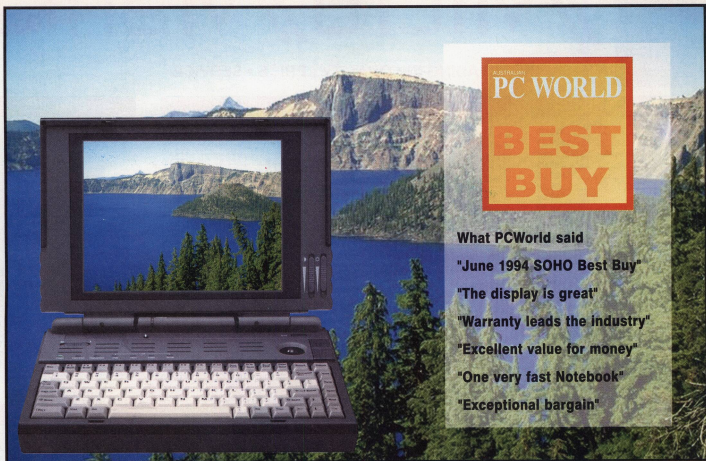
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"Excellent value for money"

"One very fast Notebook"

"Exceptional bargain"

Multimedia

featherweight

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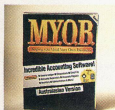
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BEST BUYS

The pressure is on PC users to consider the DX2 machine as the entry-level platform of choice. So for all those 486SX owners who are wondering about the possibility of an upgrade to the DX2 Overdrive chip, Price Watch decided to find out what the upgrade market has to offer.

We told retailers we were upgrading a 486SX/25 with 4M of RAM and a 105M hard drive. We said we wanted a DX2 chip (speed was not specified), and extra RAM and disk space without specifying sizes. The responses we got varied from the

PRICE The pains, perils and pay-offs of upgrading. WATCH

astounding: "... the DX2 is not available yet," from Peripherals Plus through to the extremely well informed respondent at IPC. She asked for a description of the socket types, if speed was set by jumpers or oscillator, and basic details of BIOS setup even before trying to sell the chip.

The main finding our ring-around produced was that dealers are still likely to sell you what they have in stock, rather than what you want or what you need. This applies especially to DX2 chips, where knowing beforehand what motherboard, socket type and speed is essential to a considered answer. If you are upgrading, you will need to know what kind of socket you have (ZIF or Overdrive external), the standard speed of the board and if it has configurable jumpers or a one-clock oscillator

crystal. These will all affect the ease with which you can add a DX2 chip, no matter what the salesperson tells you.

A couple of dealers asked if we wanted genuine Intel DX2 chips, and were prepared to offer AMD alternatives, but neither tried to palm us off with the cheaper CPU instead of the Intel item. Most were fairly sketchy in their description of how the upgrade was performed, apart from LogicWare who gave a very comprehensive description of the process, the tool used and the various socket arrangements. Most of the other dealers described the process as easy, straightforward, or a five-minute job, apart from IPC who said it was advisable to send the machine to their workshop for fitting.

About half the retailers we called asked some questions about the board and maker, others appeared ready to sell us any chip, regardless of what machine it was put into. The other area to be aware of when asking for quotes is the 'sales tax excluded' technique. Beware of suspiciously low prices as they are often ex-tax. At least two retailers we spoke to used this ploy.

There was very little variation in RAM prices, around \$60 to \$65 being the norm for a 1M SIMM. No retailers tried to push

Our charter and method

Price Watch is an interesting exercise in comparative technologies, relative prices and human nature. All investigations are conducted anonymously, and conversations are annotated. Prices and system capabilities printed here are provided by the sales staff at the offices we contacted, and all information is as supplied. While we assume that these are correct we cannot accept any responsibility for errors or omissions. Neither will we be held to account by companies mentioned here for omissions to product ranges or system capabilities. The responsibility rests with sales staff to provide adequate information, as the company would expect them to do with every customer.

more than 8M RAM, or even asked what operating system or software was being used. With respect to hard drives, the price variation was slightly higher, ranging from \$349 down to \$260. While most retailers were happy to quote for 210M drives, many were keen to promote the virtues of the next size up (420M) not as having more space, but as being better value.

All companies offered a replacement service if any faults were found with

the chip. Strangely, this varied between 12 months and a lifetime warranty for the same chip! Installation charges for CPUs were also highly variable, with anything from nil to \$65 being quoted. Most retailers offered a disk fitting and data transfer service too, and again this varied enormously from an all inclusive \$20 to \$60 on top of the CPU exchange.

Any user looking for an upgrade to their existing CPU should be aware

that there are a host of alternative options, and with the cost of new machines spiralling ever downward it pays to ensure you are getting the best price deal on any chip upgrade. Indeed, some dealers indicated they would haggle if pressed. But with such a vitally important part of your PC, it is obvious good support must be high on the list too. So ensure the deal combines a good price with sufficient backup and warranty.▲

UPGRADES

Supplier	Phone	CPU cost	Drive cost	4M RAM cost	Installation	Warranty
Upgrades Plus	(03) 699 2100	DX2/66 \$400	210M \$260	\$280	CPU nil, hard drive \$35	Lifetime CPU, 3 years drive
Pulsar Technics	(03) 639 1733	DX2/50 \$417	340M \$350	\$220	CPU nil, hard drive \$20	Replacement
Harris Technology	(02) 957 1142	DX2/66 \$402	212M \$324	\$318	CPU \$60	Lifetime CPU
IPC	(03) 532 1886	DX2/66 \$429	210M \$349	\$320	\$65 inclusive	12 months CPU, 3 years drive
Microdot	(03) 894 1255	DX2/66 \$440	210M \$290	\$260	CPU nil, hard drive nil, data transfer \$50 to \$60	Lifetime CPU
STC	(052) 23 2415	DX2/66 \$400	210M \$270	\$240	CPU \$20	12 months CPU
LogicWare	008 804 799	DX2/50 \$355	210M \$300	\$260	No	Lifetime CPU
Qualitech	(07) 535 4855	DX2/66 \$395	212M \$295	\$260	CPU nil	Lifetime CPU, 3 years drive
Memory World	(02) 906 4533	DX2/66 \$380	212M \$205	No	No	Lifetime CPU
Peripherals Plus	(02) 890 2727	DX2 not yet available!				
Rod Irving Electronics	(03) 639 1640	DX2/66 \$400	212M \$289	\$260	CPU \$38, hard drive \$35	12 months CPU, if installed by RIE
Micro Mania	(02) 560 0811	DX2/50 \$350	214M \$320	\$340	CPU nil, hard drive no charge	12 months CPU

BEST
BUYSAUSTRALIAN
MICRO
SYSTEMS

BY NAT TUNBRIDGE

Although they go under the catch-all title of an IT solutions company, AMS Australia is really a total systems provider, supplying systems integration in the UNIX/client-server world for major corporate and government accounts. They have two sales channels retailing hardware, software and peripherals to customers, and through a direct sales organisation they cater for anything from schools to the general public and small businesses looking for a low-cost sale channel.

When looking at the statistics, which include being rated as the 48th largest computer company and 17th fastest growing private company in Australia, it's easy to forget that IT solutions company Australian Micro Systems was formed as recently as 1986.

In 1993 it opened its first office in Adelaide, and this year moved its headquarters from Brisbane to Sydney. With such rapid expansion, and a net revenue increase of 85 per cent for 1992, one may be surprised to learn that a central philosophy behind this company is controlled profitable growth. The others are customer satisfaction, strong vendor relationships, quality people and quality products.

It's a suite of ethics that general manager Dan Downes finds easy to identify with. Building up a solid customer base, offering clients security and stability over the course of a long-term relationship, and being adaptable to the customer's needs, is the approach he has developed. Having worked with Hewlett-Packard for several years, Mr Downes found the move to a new, smaller company challenging. "I guess one of the elements I brought to the party was a slightly wider perspective; the focus on more of a long-term goal," Mr Downes said. "It tied right in with what Alan (Brackin, manager director) wanted, which was to have a desire to 'do right' in a long-term relationship with the customer at the heart of the company."

The best practice mentality extends throughout the organisation. Mr Downes mentions the emphasis on fundamentals that has always been part of the AMS



Mr Downes: focus on the long term

equation, and helped the company avoid the negative spiral that many companies fell into at the end of the '80s. From the beginning, AMS has sought to create a cost structure that avoids borrowing and funds growth from retained earnings.

Company morale is also accorded a high priority. A profit-share scheme has been set up recently that includes employees working in the service and distribution areas, "people who don't usually get a look-in," said Mr Downes. There's also the Performer's Club, which bestows gifts on an outstanding employee every month. For the last four years there has been a general meeting of all staff members. "The idea is to break down the barriers that often exist between different interstate groups, and get people together. The warehouse guy from South Australia gets to meet the sales guy from NSW, and they're not just a voice on the end of the phone."

The meetings have also developed focus on the company's Team AMS system, another part of the AMS philosophy that concentrates on teamwork, partner relationships, increasing customer rapport and selecting vendors on the basis of business ethics. To the customer, Team Service represents the strong 25-step methodology

that the company applies to its movements, based around the five key points: plan, design, build, deliver and support.

Asked to name one of the company's strengths, Mr Downes immediately mentions the relationship with Hewlett-Packard, which extends to the company's inception, and beyond. Mr Downes clarified this odd-sounding fact when he explained that the original nucleus of AMS emerged from a Queensland surveying company, which used HP calculators in the course of their analysis. When the company evolved into AMS, the relationship stayed, and has been growing ever since, to the benefit of both companies.

Overall, it's the strong self-sufficiency of AMS that has ensured its success. That and the five-step philosophy, something that has become so ingrained in the company's behaviour that occasionally it seems unremarkable.

"I think we take it a little for granted," Mr Downes agreed, "but now that we've started dealing with different companies, I'm reminded constantly that what we do is special. We had a large-scale deal that fell through in Melbourne recently, simply because it didn't fit in with those ethics, so it isn't just talk. We really mean it." ▲

Company snapshot

Company name: Australian Micro Systems
ACN number: 010 854 994

Phone: (02) 934 5700

Fax: (02) 934 5792

Is there hotline support? Yes

Hotline hours: 9am to 5.30pm

Hotline phone number: (07) 246 7701

Who provides maintenance: For the most part, AMS. They will go onsite regularly and do proactive work.

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Guarantee delivery time: No

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486-SX33 VESA  Harris-E433/SV Minitor or Desktop \$706 - i80486SX 33MHz processor - 256K processor Cache - 2 x Vesa 32bit, 6x Isa 16bit slots - 1.44Mb 3.5" Teac FDD - Ports: 2x Ser, 1 x Par, Ptr, Game - Enhanced IDE H.D. Controller 4Mb Ram, Max 64Mb 312 Honeywell 101 Keyboard 88 Conner 210Mb IDE Hdd 345 Trident VESA Graphics 1mb 159 Mag SVGA 14" Monitor 465 Dos 6.2 & Win for WkGrps 169 Hi-Rise mouse 23 \$1,985ex \$2,267inc	486-SX2/50 VESA  Harris-E4250/SV Minitor or Desktop \$835 - i80486SX2/50 MHz processor - 256K processor Cache - 2 x Vesa 32bit, 6x Isa 16bit slots - 1.44Mb 3.5" Teac FDD - Ports: 2x Ser, 1 x Par, Ptr, Game - Enhanced IDE H.D. Controller 4Mb Ram, Max 64Mb 312 Honeywell 101 Keyboard 88 Conner 210Mb IDE Hdd 345 Trident VESA Graphics 1mb 159 Mag SVGA 14" Monitor 465 Dos 6.2 & Win for WkGrps 169 Hi-Rise mouse 23 \$2,100ex \$2,396inc	486-DX2/66 VESA  Harris-E4266/DV Minitor or Desktop \$971 - i80486-DX2/66MHz processor - 256K processor Cache - 2 x Vesa 32bit, 6x Isa 16bit slots - 1.44Mb 3.5" Teac FDD - Ports: 2x Ser, 1 x Par, Ptr, Game - Enhanced IDE H.D. Controller 4Mb Ram, Max 64Mb 312 Honeywell 101 Keyboard 88 Conner 210Mb IDE Hdd 345 Trident VESA Graphics 1mb 159 Mag SVGA 14" Monitor 465 Dos 6.2 & Win for WkGrps 169 Hi-Rise mouse 23 \$2,213ex \$2,532inc	486-DX4/100 V.  Harris-E4100/DV Minitor or Desktop \$1,758 - i80486-DX4/100 MHz processor - 256K processor Cache - 2 x Vesa 32bit, 6x Isa 16bit slots - 1.44Mb 3.5" Teac FDD - Ports: 2x Ser, 1 x Par, Ptr, Game - Enhanced IDE H.D. Controller 4Mb Ram, Max 64Mb 312 Honeywell 101 Keyboard 88 Conner 210Mb IDE Hdd 345 Trident VESA Graphics 1mb 159 Mag SVGA 14" Monitor 465 Dos 6.2 & Win for WkGrps 169 Hi-Rise mouse 23 \$2,896ex \$3,319inc	P5-60 PCI  Harris-P560/DP Minitor or Desktop \$1,875 - iPS-Pentium 60 MHz processor - 256K processor Cache - 3 x PCI 32bit, 4 x Isa 16bit slots - 1.44Mb 3.5" Teac FDD - Ports: 2x Ser, 1 x Par, Ptr, Game - Enhanced IDE H.D. Controller 4Mb Ram, Max 128Mb 312 Honeywell 101 Keyboard 88 Conner 210Mb IDE Hdd 345 Diamond Stealth32 1Mb PCI 31 Mag SVGA 14" Monitor 465 Dos 6.2 & Win for WkGrps 169 Hi-Rise mouse 23 \$3,129ex \$3,599inc
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P5-66 PCI  Harris-P566/DP Minitor or Desktop \$2,066 - iPS-Pentium 66 MHz processor - 256K processor Cache - 3 x PCI 32bit, 4 x Isa 16bit slots - 1.44Mb 3.5" Teac FDD - Ports: 2x Ser, 1 x Par, Ptr, Game - Enhanced IDE H.D. Controller 4Mb Ram, Max 128Mb 312 Honeywell 101 Keyboard 88 Conner 210Mb IDE Hdd 345 Diamond Stealth32 1Mb PCI 31 Mag SVGA 14" Monitor 465 Dos 6.2 & Win for WkGrps 169 Hi-Rise mouse 23 \$3,318ex \$3,818inc	P5-90 PCI  Harris-P590/DP Minitor or Desktop \$2,739 - iPS-Pentium 90 MHz processor - 256K processor Cache - 3 x PCI 32bit, 4 x Isa 16bit slots - 1.44Mb 3.5" Teac FDD - Ports: 2x Ser, 1 x Par, Ptr, Game - Enhanced IDE H.D. Controller 4Mb Ram, Max 128Mb 312 Honeywell 101 Keyboard 88 Fujitsu E/IDE 265Mb H.D. 382 Diamond Stealth32 1Mb PCI 350 Mag SVGA 14" Monitor 465 Dos 6.2 & Win for WkGrps 169 Hi-Rise mouse 23 \$3,930ex \$4,528inc	P5-60+ PCI  Harris-P560/DP 5 Bay Minitor \$1847 - Pentium 60MHz processor - 256K processor Cache - 3 x PCI 32bit, 5 x Isa 16bit slots - 1.44Mb 3.5" Teac FDD - Ports: 2x Ser, 1 x Par, Ptr, Game - Enhanced IDE H.D. Controller 16Mb Ram, 72p, Max 128Mb 1244 Honeywell 101 Keyboard 88 Conner 420Mb IDE Hdd 447 No. 9 GXE 64, 1Mb 416 Mag SVGA 15" Monitor 749 Dos 6.2 & Win for WkGrps 169 Microsoft Mouse OEM 42 \$4,406ex \$5,002inc	P5-66+ PCI  Harris-P566/DP 5 Bay Minitor \$2,066 - Pentium 66MHz processor - 256K processor Cache - 3 x PCI 32bit, 5 x Isa 16bit slots - 1.44Mb 3.5" Teac FDD - Ports: 2x Ser, 1 x Par, Ptr, Game - Enhanced IDE H.D. Controller 16Mb Ram, 72p, Max 128Mb 1244 Honeywell 101 Keyboard 88 Conner 420Mb IDE Hdd 447 No. 9 GXE 64, 1Mb 416 Mag SVGA 15" Monitor 749 Dos 6.2 & Win for WkGrps 169 Microsoft Mouse OEM 42 \$4,595ex \$5,221inc	P5-90+ Pci  Harris-P590/DP 5 Bay Minitor \$2,739 - Pentium 90MHz processor - 256K processor Cache - 3 x PCI 32bit, 5 x Isa 16bit slots - 1.44Mb 3.5" Teac FDD - Ports: 2x Ser, 1 x Par, Ptr, Game - Enhanced IDE H.D. Controller 16Mb Ram, 72p, Max 128Mb 1244 Honeywell 101 Keyboard 88 Conner E/IDE 540Mb H.D. 571 No. 9 GXE 64, 1Mb 416 Mag SVGA 15" Monitor 749 Dos 6.2 & Win for WkGrps 169 Microsoft Mouse OEM 42 \$5,284ex \$6,021inc
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MONITORS

NEC ON SPECIAL

NEC 2V 14" 1024 x 768, 0.28 dot pitch \$699
 NEC 3V 15" 1024 x 768, 0.28 dot pitch \$999
 Multi-frequency up to 1024x768 Nt (70Hz),
 Intelligent Power Management functions. Com-
 patible with Macs. (Mac Adapter \$25.00)

4FGE 15" 1024 x 768, 0.28 dot pitch \$1,248
 Compatible with Macs. (Mac Adapter \$25.00)
 4FGE 15" 1024 x 768, 0.28 dot pitch \$1,248
 Compatible with Macs. (Mac Adapter \$25.00)
 4FGE 15" 1024 x 768, 0.28 dot pitch \$1,248
 Compatible with Macs. (Mac Adapter \$25.00)

5FGP 17" 1280 x 1024, 0.28 dot pitch \$2,399
 6FGP 17" 1280 x 1024, 0.28 dot pitch \$2,599
 1280x1024 (60-74Hz), 1024x768 (60-74Hz)
 0.28mm Trn Dot Pitch, MPR-11 Low Radi-
 ation, Digital/Control, Colour Accuracy, Intelligent
 Power Management (VESA DPMs Compliant),
 Opticable Screen Coating.

OTHER MONITORS

Magtron	
Mag 14" SVGA 800x600 Non Int	\$387
Mag 14" 1024x768 Non Int Lc	465
Mag BMC15F 15" 1024x768 Nt	540
Mag DX15F 15" 1280x1024 Nt Lc	749
Mag MX15F 15" 1280x1024 Nt Lc	879
Mag MX17F 17" 1280x1024 Nt Lc	1,625
Mitac	
Mitac 14" 1024x768 Nt Lc	473
Mitac 15" 1024x768 Nt Lc	760
Mitac 17" 1024x768 Nt Lc	1,409
Viewsonic	
Viewsonic 14" 1024x768	460
Viewsonic 15" 1024x768 Non Int.	513
Viewsonic 15" 1280x1024 Nt Lc	795
Viewsonic 17G 17" 1280x1024 Nt Lc	1,794
Viewsonic 17" 1600x1280 Nt Lc	2,175
Viewsonic 20" 20" 1600x1280 Nt Lc	3,371
Viewsonic 21" 21" 1600x1280 Nt Lc	4,177

Configure Your Own System

Instead of having a

MAC 15" MONITOR (\$749)

in this system, you might prefer, let's say, a

VIEWSONIC 15 (\$795)

Simply replace \$749 with \$795 and add up the right column again, \$5,047. In this example.

You can therefore price your own configuration by referencing Base Systems, Monitors and Graphics Cards on this page.

Please call for pricing on ISA Graphics Cards

GRAPHICS CARDS

ATI GRAPHICS CARDS	
Grphs Xpression 2mb Dram 64B Vesa	489
Grphs Winturbo 2mb Dram, 64B Vesa	671
Ati Grphs Ultra Pro 2M Vram-Vesa	734
Grphs Xpression 2mb Dram 64B Vesa	489
Grphs Turbo Pro 2mb Vram 64B Vesa	734
ACTIX GRAPHICS CARDS	
Prostar 64B 1M Card	325
Graphics Eng 64 1M Dram PCI	404
32V/L Graphics 33 1M Dram Vesa	316
321 Graphics 33 2mb Dram	428
DIAMOND GRAPHICS CARDS	
Speedstar Pro Vb Card, 1mb, Vesa	281
Viper 24 Card, 2mb, Vesa	686
Viper SE Card, 2mb, Vesa	686
Viper SE Card, 4mb, Vesa	1134
Stealth 3D Card, 2mb, Vesa	392
Stealth 4Vram 2mb, Vesa	668
Stealth 4Vram 4mb, Vesa	959
Viper Pro Vram 2mb, PCI	767
Speedstar 64 Card 1mb, PCI	386
Speedstar 64 Card 2mb, PCI	414
DIAMOND CONT...	
Viper 2mb, PCI	701
Viper SE 2mb, PCI	701
Viper SE 4mb, PCI	734
Stealth 4 2mb Dram, PCI	489
Stealth 4 4mb Vram, PCI	959
#9 53 GRAPHICS CARDS VESA	
#9GXE Apex, 1600x1280, 4mb Vram	191
#9GXE64 1152x870 Vesa, Dram, 1mb	416
#9GXE64 1280x1024 Vesa, Dram, 2mb	571
#9GXE64-pro, 1600x1280, Vram, 4mb	150
#9 53-4 BIT GRAPHICS CARDS PCI	
#9GXE64 1280x1024, 1mb	416
#9GXE64 1280x1024, 2mb	571
#9GXE64-pro, 1600x1280, Vram, 4mb	150
Trident 9400ci Vesa Vesa 1mb	150

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NoteBook Computers

Starting as at October 13th, 1994

Please call for the best price
for any NoteBooks
not listed on this page.

TOSHIBA

5-Star
Dealer



\$2,290
T-1910 486SX33
Monochrome LCD
4 Mb Ram, 120 H.D.



\$2,790
T-1910 486SX33
Monochrome LCD
4 Mb Ram, 200 H.D.



\$3,250
T-1910 486SX33
Passive Colour
4 Mb Ram, 120 H.D.



\$3,330
T-1910 486SX33
Passive Colour
4 Mb Ram, 200 H.D.

Monochrome T-1910's feature a 3000 Transflective screen for high contrast and resolution. The colour models feature Passive STN, 256 colour at 640 x 480 resolution.

All of the T-1910's include Dos 6.0, Windows and a trackball mouse. Other features: Ram is expandable to 20Mb, External Ports - VGA, PS/2 Mouse port, serial RS-232, Parallel/Internal FDD port. 1 x PCMCIA type i - ii slot. Weight 3.9kg, 12 months international parts and labour warranty.



\$4,750
T-2400 486DX250
Passive Colour
4 Mb Ram, 250 H.D.



\$4,930
T-2400 486DX250
Passive Colour
4 Mb Ram, 320H.D.



\$6,190
T-2400 486DX250
Active Colour
8 Mb Ram, 250 H.D.



\$6,350
T-2400 486DX250
Active Colour
8 Mb Ram, 320 H.D.

Sub Notebook featuring SL Enhanced Intel 486DX Processor, (3.3 volt.) Passive colour RAM expandable to 20mb, Active expandable to 24mb. Vesa graphics adaptor, 1 PCMCIA Type II & 1 x type III, built in speaker and microphone. Lightweight, removable Nickel Metal Hydride battery, avg life 2+ hours. Average charge time 2.3 hours. 3.2 Kgs with battery. 12 Months International Parts and Labour warranty.



\$3,950
T-3400 486SX33
Monochrome LCD
4 Mb Ram, 120 H.D.



\$4,698
T-3400 486SX33
Active TFT Colour
4 Mb Ram, 250 H.D.



\$6,490
T-3600 486DX250
Active TFT Colour
8 Mb Ram, 250 H.D.

Highly portable T-3400 Sub-Notebooks weigh in at a fractional 2.25 Kg (2.45 - Col) but offer 486SX33 power. 30% smaller than an A4 Notebook, 1 PCMCIA Type II slot, preinstalled DOS 6.0 and Windows 3.1, Accupoint pointing device, removable Lithium Ion Battery 3.6hr, Power on Password, RAM options 4, 8 or 16Mb.

As for the T-3400 with 8Mb Ram, Expandable to 24Mb Ram. 1Mb Video Ram. Weight 2.2 Kg.



\$7,550
T-4700 486DX250
Active TFT Colour
8 Mb Ram, 320 H.D.



\$9,150
T-4700 486DX250
Active TFT Colour
8 Mb Ram, 500 H.D.



\$11,490
T-4900 Pent.75
Active TFT Colour
8 Mb Ram, 610 H.D.

80486 DX2-50 The T-4700, Dos 6.0, Windows 3.1, Win Sound System, In-built stereo speaker, slip-cover, Direct-Connect Ballpoint Mouse, Ram exp to 24Mb, Active TFT colour screen, 2 x PCMCIA (1 x type i, 1 x type ii) 2 - 3 hour NiMH battery, 3 yr int'l warranty.

A4 Notebook with Intel DX4 (3.3v) 75MHz, 16Kb Cache, 8Mb RAM (Max 24) 1.44MB FDD, 500MB HDD 12msc, Active TFT Colour LCD 9.5" Battery Recharge 2 hours, Battery Life 2 hours, 3 parts & Labour

BLOW THEM AWAY
• PENTIUM NOTEBOOK
• 810MB HARD DISK
• MULTIMEDIA
• 2 X PCMCIA

ZENITH



\$Call
NoteFlex 486 SX33
Monochrome LCD
8 Mb Ram, 200 H.D.



\$Call
NoteFlex 486 DX2/50
Passive Colour
8 Mb Ram, 200 H.D.



\$Call
NoteFlex 486 DX2/50
Active Colour
8 Mb Ram, 200 H.D.



\$Call
NoteFlex 486 DX475
Active Colour
8Mb Ram, 340 H.D.

Zenith Z-NOTEFLEX is available in 486 SX33 mono, DX2/50 Passive & Active, and DX475 Active TFT colour. Ram expandable to 24Mb. Built in 16 bit Stereo Audio, 2 x PCMCIA type II & 1 x type III slots. The Z-Noteflex offers amazing modularity. All major components are easily removable and upgradeable—by the user. In fact, THIRTY SEVEN CONFIGURATIONS are possible, please call for details.

>> FREE 3 YEAR ACCIDENTAL DAMAGE WARRANTY! <<



\$2,590
Z-Lite 486 SL25
Monochrome LCD
4 Mb Ram, 170 H.D.



\$3,750
Z-Lite 486 SL33
Passive Colour
4 Mb Ram, 200 H.D.



\$3,990
Z-Lite 486 SL33
Active Colour
4 Mb Ram, 200 H.D.

Intel 486SL, 25MHz Low power CPU, 8.5" backlit VGA Mono screen. Or Intel 486SL 33MHz Passive Colour with J-Mouse, BK Internal cache, Ram exp to 20Mb, 2 x PCMCIA type II slots. 3 hour NiMH battery. Includes Dos 6.0, Windows 3.1, Liaspoint trackball.



\$3,750
T-1960 486DX2/50
Passive Colour
4 Mb Ram, 200 H.D.



\$Call
Z-STAR EX 486 DX2/50
Monochrome LCD
4 Mb Ram, 200Mb H.D.



\$Call
Z-STAR EX 486 DX2/50
Passive Colour
8 Mb Ram, 340H.D.



\$Call
Z-STAR EX 486 DX2/50
Active Colour
8 Mb Ram, 340H.D.

The Zenith Z-STAR EX series have a Cyrix 486DX2/50 Mhz CPU, Ram expandable to 20Mb. In-built enhanced "J-Mouse," 2 x PCMCIA type II slot, NiMH 4 - 6 hour battery. Modular design allowing future upgrade paths. Includes Microsoft DOS 6.21 and Microsoft Windows 3.1 & Co-Session Host. 3 Year warranty.



\$4,940
T-1960 486DX2/50
Active TFT Colour
4 Mb Ram, 200 H.D.

T-1960 features: Ram expandable to 20Mb, External VGA, PS/2 mouse, Serial RS-232 & Parallel ports, 1 x PCMCIA type i - ii slot, Nickel Metal Hydride battery up to 4 hours charge, 3.0 Kg. Includes Windows 3.1 & Dos 6.0 12 Month international parts and labour warranty.

CANON



\$6,290
BN-32 486SL250
Passive Colour
4 Mb Ram, 130 H.D.



\$7,100
BN-32 486SL250
Passive Colour
4 Mb Ram, 260Mb H.D.

The latest offering from CANON Technology. The BN-32 & 100 series combine a colour screen notebook with a **BUSINESS-CLASS BUILT-IN!** The BN-32 or 100 includes Dos 6.0 & Windows 3.1, Printer speed is 116 cps and has a 10 sheet feeder, 2 button trackball mouse. Ram expandable to 12Mb. Also includes 2 x PCMCIA slots, 1 year parts and labour warranty.

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NoteBooks & Accessories

PHILIPS



\$3,245

MediaNote 486 SX25
Monochrome LCD.
4 Mb Ram, 250 H.D.



\$4,290

MediaNote 486 SX25
Passive Colour.
4 Mb Ram, 250 H.D.



\$3,690

MediaNote 486 DX2/66
Monochrome LCD.
4 Mb Ram, 250 H.D.



\$4,731

MediaNote 486 DX2/66
Passive Colour.
4 Mb Ram, 250 H.D.



\$6,950

MediaNote 486 DX2/66
Passive Colour.
4 Mb Ram, 250 H.D.

Intel 486SX or DX up to DX4/100, RAM Expandable to 36Mb, Award BIOS, 128K cache, Vesa Local Bus Graphics Accelerator. Soundblaster compatible sound card built in. Inbuilt Mic and speaker. 1 x PCMCIA type IV. Line in, line out, mic jack, 1 x serial & 1 x parallel ports, ext keyboard & monitor ports. 2 x NiCAD or NiMH with power on swap support. 3 year warranty.

4 Meg Upgrade **\$450**
12 Meg Upgrade **1250**
Extra Ni-Cad Battery **125**

Extra Ni-MH Battery **156**
Mini docking sin, port repl. **250**
Docking Station **999**

MITAC



\$3,990

Mitac 486DX2/66
Passive Colour.
4 Mb Ram, 250 H.D.



\$7,859

Mitac 486DX2/66
Passive Colour.
20 Mb Ram, 540 H.D.



\$6,673

Mitac 486DX2/66
Active Colour.
4 Mb Ram, 250 H.D.

Intel DX2/66, RAM Expandable to 8 or 20Mb, Phoenix BIOS, 8K CPU cache, Ports: Serial, Parallel, Std Keyboard, PS/2 Mouse & internal VGA. 1 internal SIO for Fax/Modem. User removable Hard disk, 2 x PCMCIA Type II slots. 2 hour battery. Includes DOS 6.0 & Windows 3.1 and carry bag. 1 year parts and labour warranty.

RAM

CANON RAM

2mb Simm for BN22 204
4mb Module for BN100 421
4mb Simm for BN22 529
4mb Simm for BN22 482
8mb Module for BN100 857
8mb Simm for BN22 932
8mb Simm for BN22 1024

MITAC MEMORY

Mitac 4mb Card 13028/4028g 475
Mitsc 8mb Card 13028g/4028g 967
Mitsc 4mb Card 13028g/4028g 576
Mitsc 4mb Card 140203CX/4022 435
Mitsc 4mb Card 14021GX 435
Mitsc 16mb Card 14021GX 1890

PHILIPS RAM

Mediatec - 4mb Ram 1250
Mediatec - 12mb Ram 1250

TOSHIBA RAM

2mb Ram: T6600C 258
4mb: T2000CX/T2001T18x 400
4mb: T2400, T3400, T3600C1 420
4mb: T1400, T18400, T3600C 399
4mb: T1900, T1950, T4500, T4600, T4700 599
4mb Compst: T4500 435
4mb Cp T2001T1900/10500/4700 395
8mb: T2000, T2200T18X 716
8mb: T2400C, T3400, T3600C1 807
8mb: T6600C 775
8mb: T200, T910, T950, T4700, T4800 1145
8mb Cp T900, T950, T4800, T4700, T4800 790
16mb: T2400C, T3600C1 3756
16mb: T3300SL 1425
16mb: T3400 Series 3.3v 2254
16mb: T4400, T54 XX, T5600C 1294
16mb: T200, T910, T950, T4700, T4800 2804
16mb Cp T900/T500, T4600/T4748 1419
16mb Comp Ram: T2400/3600 1844

TOSHIBA CONT.

16mb Compatible Ram: T3400 1439
16mb Compatible Ram: T4500 1419
32mb: T1400, T6400, T6600C 7370
32mb Compatible Ram: T3400 4379
32mb Compst 4002SX/T6600 3529

ZENITH RAM

4mb Module for 2LITE 470
8mb Module for 2-Lite 880
25Star-Ex 4mb Ram 490
25Star-Ex 16mb Ram 2230
8mb Ram for Noteflex 536
8mb Ram for Noteflex 570
16mb Ram for The Noteflex 1660
2mb Module for Z-Star 340
8mb Module for Z-Star 896
4mb Module for 25Star-Ex 529
16mb Module for 25Star-Ex 2563

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Calluna Type III - 105mb **879**
Calluna Type III - 130mb **1052**
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SCSI-2 Bus-loaster Card **435**

PCMCIA MISCL

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Mobilmax Deskrunner Type III 105mb HDD **328**
Hi Speed 16C550 Ser HPIB Interface **428**

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Compex Adap w BNC Coupl **593**
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Apex Ethernet Adap 10-T **449**
Apex Ethernet Adap 10-B **634**
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Networthy Type II 10-T Card **480**

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105mb H D V2.01 Type III **1016**
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Data/FM 14, 400/9600 Z-Star/L835 **605**
Data/FM 2400/9600 **605**
Data/FM 14400 **677**

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10-2 Ether Adap 1 Star/Lite **690**
Token Ring Adap 1 Star/Lite **1248**

ZENITH CONT...

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Ether Combo Card 10-2 Zllex 428
Token Ring Card for Zllex **1001**

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Apex 14.4K/14.4K Cts 182 **459**
Netcom 9600/2400 Cts-1 **291**
Netcom 14.4/14.4baud **464**
Redcard 2400/9600 **373**

Redcard 14.4/9600

11.4/14.4/14.4 Bps **726**
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Ethernx Ether Card, T2 10-T **393**
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D-Link T2 Ether Adap, 10-T **367**
D-Link T2 Eth Ad, 10-T/Coax **367**
3Com E-ik III 3C589-TP **360**
3Com E-ik III 3C589-5 pak **1771**
3Com E-ik III 3C589-2 **451**
3Com E-ik III 5Pk **2159**
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3Com C-ik III 3C589-TP **385**
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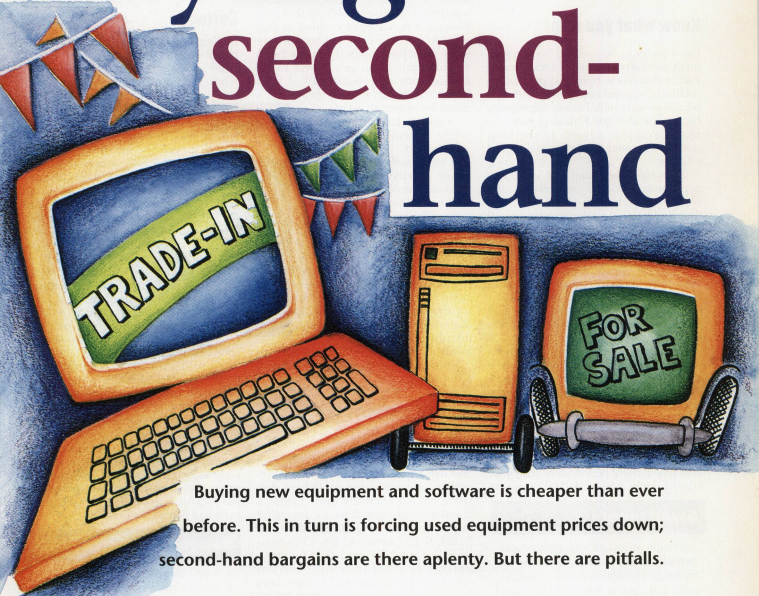
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Buying second-hand



Buying new equipment and software is cheaper than ever before. This in turn is forcing used equipment prices down; second-hand bargains are there aplenty. But there are pitfalls.

BY JEREMY TORR

According to many makers you should abandon that old XT with WordStar and the accompanying dot matrix printer, in favour of the latest blazing desktop performer. And sales prove many of us are doing just that. Which begs the question: where does all that old, working equipment go? Some companies offer trade-ins, but most of us just keep that old PC and software in a cupboard, or perhaps sell it through the local paper. So if you are smart, you can pick yourself up a very serviceable second machine or extra software for a snip. Here's how.

alent) is also handy for checking the health of any hardware. No genuine vendor will object to this condition.

Stick to your price

It is very easy to get carried away and spend more than you want to on some attractive looking extras. Remember vendors are usually selling this gear because it is not quite as good as they want to have, so there are bound to be some slight limitations. If you don't stick to your guns, you can expect to get landed with a cupboard full of junk. Which you in turn will find great difficulty in getting rid of.

If you can bargain, it is worthwhile offering a "take it all away" price. Often the vendor will be pleased to make a clean sweep of redundant equipment and software; this is where some real bargains such as cables, mice, software utilities and more can be snapped up for almost nothing.

If you can, make sure all the manuals are supplied with the equipment. This applies especially to hardware, where configuration changes can be a nightmare without the relevant information. If manuals are not available, either get the name of the supplier or maker, or demand a substantial reduction in price.

All that's grubby is not rubbish

The other way to profit by buying second-hand is to expand your current system. If you are running out of hard disk space, but it is not really worth buying a brand new hard disk drive, then consider buying a second-hand one. You may well be able to pick up an old 286, XT or similar with a good IDE hard drive for much less than the cost of a new drive. Plus you also get a set of free RAM chips, keyboard, monitor et al. Having said that, be wary of buying second-hand components that are not in a working PC — finding out they are the wrong speed, type or simply dodgy doesn't help once you have bought them.

Remember also that although it is not recommended to buy second-hand equipment parts from swap meets, you will always be able to sell old gear for something at such events. So buying a banger, stripping out the parts you want then selling the rest on is perfectly feasible.

The other way to profit from a second-hand buy is to buy a banger and trade it in. IBM and some other manufacturers are offering guaranteed swap-over prices on older models. If you can pin down an old machine for less than the trade-in price, you are ahead before the game starts.

Software

Buying second-hand software can also be either very good or bad. Genuine, brand name packages and applications are well worth looking at, but older, different format, well used and possibly

virally infested applications are worth steering clear of. The safest way to buy used software — especially with respect to software licensing — is to stick to CD versions with manuals. These are always clean, are difficult to pirate and will generally be more recent versions. And never pay extra for a second-hand PC that "comes with loads of software already on the disk". It is unlikely you will be able to register it in your name, get support, trade up or any of the usual perks genuine buyers expect. Demand manuals, boxes, and original disks or nothing. With a corre-

sponding price reduction.

As with most other used equipment, there is an element of risk in buying second-hand computer equipment. However, as the market matures, equipment becomes more reliable and customers become more knowledgeable, buying second-hand will definitely become a sound option for users on a budget. Possibly even more so than opting for a super cheapo no-name clone with dubious backup. There is always that bargain to be had if you take care. ▲

Second-hand rules

1. Never buy more than you need.
2. Always see the item working first.
3. Be wary of swap meet 'bargains'.
4. Ask about spares/upgrades.
5. Ask for a receipt.
6. Take your own demo/peripherals as a test.
7. Never let the vendor come to your house/office.
8. Check if the supplier is still in business.
9. Stick to well-known brand names.
10. Remember bargains can be had.
11. Caveat emptor.



Know what you want

Good places to buy second-hand equipment and software are the local *Trading Post* or equivalent. Specialist publication small ads, regional newspapers and signboards outside milk bars or community centres are also good hunting grounds. Small 'Wanted' adverts in the local school newsletter can often yield good responses.

Be wary of anything that is slightly non-standard. It is easy to pick up a fully working portable for under \$500, and then find it is useless thanks to its special disk format. No matter how much of a bargain the item seems, it is a waste of money if you can't use it with current software or hardware. Unexpended PCs, software with only 9-pin printer support and special peripheral connectors are all definite no-nos no matter how little they cost. So don't get bargain fever and a dud as a result.

Once you have made the initial contact and agreed the equipment or software is what you are looking for and is in your price range, arrange to see it. Never arrange for the sales person to come to your computer site to demonstrate the equipment. This is a well-known "casing the joint" ploy. Take your existing peripheral equipment or a sample software disk with you to check performance with your existing setup. A test disk (MSD or equiv-

Swap meets

Although advertised as grass-roots events, these are usually just vehicles for cut-price traders. As such you can possibly get a bargain, but are unlikely to be able to do a straight swap of old for new.

Be extremely wary of any unsupervised hardware. Being told a chip works is no consolation if it doesn't when you get home. Some Swap Meet traders have full daytime addresses and phone contacts, but are unlikely to offer normal retail trader facilities. Always ask for receipts, contact numbers and backup. If this is a problem, don't buy.

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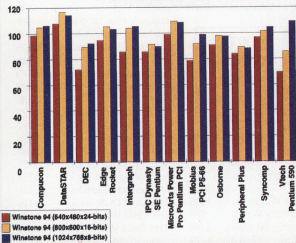
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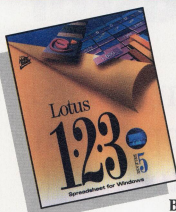


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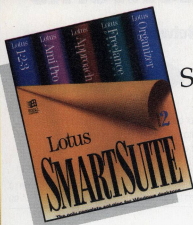
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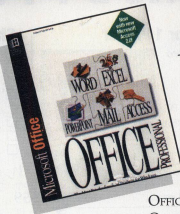


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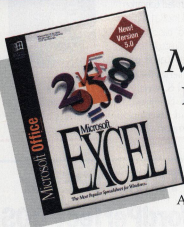


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Data Link - The Network for 1 Printer

- ☐ Simple installation - plug in, connect cable and print - it really is that simple!
- ☐ PCs are "daisy chained" to printer with unobtrusive RJ11 telephone cable
- ☐ Eight metres of cable included free for each PC
- ☐ Cable lengths can be up to 1500' (350 metres)
- ☐ Fast print speed (8250 cps)
- ☐ Start with two PCs, add extra PCs as needed



Data Link Transmitters (inc 8m cable) - 1 per PC (up to 20) \$59
Data Link Receiver (for printer) 59
Data Link Parallel Extender (print up to 350 metres) 118

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Per PC

Print Link - The Network for 1-4 Printers

- ☐ Simple installation - plug in, connect cable and print
- ☐ PCs are "daisy chained" to printers with unobtrusive RJ12 telephone cable
- ☐ Each PC has simple rotary switch to select printer
- ☐ Eight metres of cable included free for each PC
- ☐ Cable lengths can be up to 1500' (350 metres)
- ☐ Fast print speed (8250 cps)
- ☐ Start with two PCs or printers, add extra PCs and printers as needed
- ☐ Ideal for workgroups where network not required or too expensive



Print Link Transmitters (inc 8m cable) - 1 per PC (up to 20) \$89
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Share Wonders - The Network for 1-6 Printers

- ☐ Simple installation - Plug 'n play
- ☐ PCs "daisy chained" to printers with RJ45 telephone cable
- ☐ Each PC has simple rotary switch to "dial" the printer needed
- ☐ Eight metres of cable included free for each PC and printer (max 300 metres)
- ☐ Very fast print speed (10000 cps - around 300 A4 pages of text a minute!)
- ☐ Start with two PCs and a printer and add extra PCs and printers as needed
- ☐ Ideal for large workgroups of 1-36 PCs and 1-6 printers



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Nothing beats the Byteprint TURBO for fast, buffered, reliable and easily installed sharing.

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- ☐ Prints jobs on "first-come, first served" basis
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- ☐ PC conference facilities, displaying the same screen data simultaneously on all PCs
- ☐ Access to files and directories on other disks, with a "Lock" function for local disk security
- ☐ Pull down menus for easy access to all options
- ☐ Includes serial cable to connect two PCs. (Two dedicated serial ports required on extra PCs.)

Flexible and versatile, Bytynet can be customised for the specific needs of each user. And you can add more users as your needs grow, connecting them with a simple serial cable. Bytynet ... for inexpensive network basics.

Bytynet 4 \$169

Faster DOS and WIN Printing, GUARANTEED!



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Unlike Windows Print Manager and print utilities, PrintCache drives printers at their highest possible speed. It buffers any print or plot job at incredible speed, so you regain keyboard control and get back to work fast while your PC prints.

That's why PC Magazine says "Replace Windows' Print Manager with Print-Cache - the greatest speed increase you can get without buying a new printer!" And PC Computing enthused "Don't run your printer without it!"

PrintCache also gives you instant printer status via human voice error messages and vivid icons. PrintCache is licenced per printer, making it an even greater investment in printer sharing situations. You only need one copy for each printer. PrintCache ... faster printing, guaranteed, in Windows and DOS!

PrintCache \$169

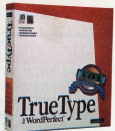
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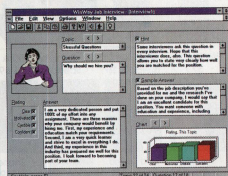
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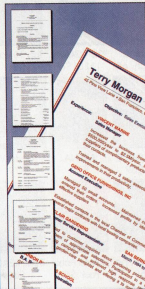
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"The user interface is so slick, you'll wonder why WinWay sent along a 50-page printed manual!" Oct 13, 1992

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What Reviews say...

WinWay Resume is "... a real winner."
PC User (June 94) review. Rating: 9/10
WinWay Job Interview "... has a well thought out interface ... is state-of-the-art ... does what it sets out to do with economy and effectiveness ... would make a great graduation present."

PC User (June 94) review. Rating: 9/10

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The New Security Menu for Windows



Ever been a little concerned about who could be using or accessing your PC when you're not around?

Even if there's nothing especially confidential on your computer, they could, accidentally or otherwise, wreck the setup you've spent so long getting just right. An effective but simple security system would be nice.

EasyDesktop provides the security you need, locking up your PC and/or its programs with a simple password system you determine appropriate. And all with a program menu system that is much faster to use and easier to follow than the standard Windows icons.

In addition to the menu system and security, you also get a stack of utilities. Control music on your CD. Split large files over multiple disks. Sample fonts. Insert special characters into any document. Graphics viewers. PKZIP compatible file compression. Alarm clocks. Memory warnings. And lots, and lots, and lots, more. Even games.

Easy to install, easy to use, everything you need.

EasyDesktop 5.0 \$69

A complete Novell-Compatible Network for \$169!



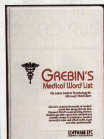
WEB Pairware is a remarkable network for two PCs. Complete with a parallel cable to connect the PCs, WEB Pairware offers users all the advantages of a network costing thousands.

DOS and Windows interfaces, disk sharing, file transfer and more. Run any single or multi-user program. Ideal for users wanting to connect their notebook to their desktop PC. Or setup a two PC workgroup to share programs and data. Plug in the cable, run the software and you're connected. Log onto the other PC and run any program ... even if there's already someone using it. Transfer files from one PC to another. Share the CD ROM or backup to the tape drive. Plug in another parallel port and you can even share the printer.

WEB Pairware is easy to install and use, making it ideal for anyone new to networking. One PC can be running DOS, the other Windows. And, by the time you're through cutting your teeth on WEB, you'll have developed an excellent understanding of quality networks ... and a yardstick with which to judge others.

WEB Pairware (inc 2 metre cable) \$169

When Medical Accuracy is Essential...



Install Grebin's Medical Word List in your word processor and enjoy automatic medical spell checking whenever you run a normal spell check.

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- ☐ Saves time looking up those complex words (like alaphidfluoromethylomithine, for example)
- ☐ Works automatically when you run your normal spell check ... nothing new to learn
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930
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Disk spinning



With nearly a million CD-ROM-capable machines predicted for next year and around 8000 CD-ROM titles currently available how can you tell the best from the rest? Our guide to some of today's hottest disks should get you started.

By Lance Ulanoff and
Nat Tunbridge

More than almost any medium that has come before it, CD-ROM invites users to get involved. "Take a journey," the boxes invite. Enter a surrealistic adventure "that will become your world." It isn't just hype. The best CD-ROMs can surprise, inform, and entertain you.

To help us zero in on the best titles from the thousands available today, we divided them into nine categories: general (tools to help better yourself or your career, such as business directories, clip-art galleries, and executive information kits); developers' tools; art and music (music or multimedia CDs, architecture, and art history); history; science; entertainment; edutainment (educational CDs and

games with educational value, usually for kids); and travel. You'll notice that there are more CDs in some categories than in others. Not surprisingly, games and children's edutainment make up the largest portion of our list. Productivity is a category that appears to be growing, but it offers far fewer disk titles of quality to choose from.

There's no question that CD-ROM is a powerful tool for entertaining, enlightening, and disseminating information. But also it contains the software most likely to test the limits of your system. Multimedia CDs, on the other hand — including games, reference CDs, and edutainment CDs — often require that you modify your AUTOEXEC.BAT or CONFIG.SYS files (or both).

So why is 1994 the year of the CD-ROM? You can thank a confluence of factors, including the arrival of triple and quadruple-speed CD-ROM drives, the continuing PC-price plunge, the sale of more multimedia-ready PCs this year than ever before, and the realisation by more and more PC users that multimedia isn't some form of voodoo after all.

According to Graham Penn from IT market research company IDC, Australia's installed base of CD-ROM drives totals 450,000. That number is expected to nearly double by the end of next year.

Peter Hall from IRB said that as much as half of these would be home users. "There's been a big surge of people buying CD-ROMs for the listings — Yellow Pages, White Pages and so forth. It's pretty clear that a lot of home users bought the CD-ROM simply because it was the thing to buy at the time. Most of the current CD-based titles available require at least a double-spin to work properly, and those users who jumped in

early are frustrated by the lack of software that will work." Mr Hall agreed that this had resulted in a layer of 'dead technology'; users whose single-speed CD-ROM drives are now virtually useless.

As PC manufacturers sell systems with everything already plugged in, they usually do the compatibility legwork as well. These multimedia-ready PCs are usually MPC-compliant systems. To meet MPC Level 2 specifications, a system must have at least a 25-MHz 486SX processor, a 160M hard disk, a 16-bit sound card (including eight-note synthesiser and MIDI playback), MIDI I/O and joystick ports, and a 300Kps double-speed CD-ROM drive that uses no more than 60 per cent of the system's processing power for data transfer. There's a good chance that if you buy an MPC2-compliant CD-ROM and pop it into your MPC-compliant system, it will run without a hitch, but there are other tools that can help you run your system and CD-ROMs successfully.

Applications on CD-ROM

What can CD-ROM technology offer typical business applications? Now that CD-ROM drives have become more prevalent on desktop PCs, that's a question many software developers and users are asking.

But while a CD-ROM version of a software package can be more convenient, prove more cost-effective, and contain more information than a floppy disk version, CD versions of business applications are still few and far between.

For large applications, such as the office suites from Lotus, Microsoft and WordPerfect, the advantages seem clear enough. Just installing the 30-something disks that contain these programs takes forever. Merely placing the floppy disk version onto a CD-ROM provides a user with an immediate benefit. And for the developer, a single CD-ROM costs less to produce than even three or four floppy disks. If the developer passes the savings on to users, everyone benefits.

So far the options include various flavours of the Microsoft Office product, and the Lotus range: 1-2-3 has long been shipping on CD, and the middle of last month saw the availability on CD of each of the applications individually, or bundled as SmartSuite.

All these vendors say they will keep their promises, but right now most are dealing with changing their packages' installation routines and determining what additional information, if any, should be on the CD versions.

One business-application vendor, Corel, has promoted CD-based applications for years and put all kinds of additional material

on the CD versions of its software. For instance, the latest release of CorelDRAW includes 825 fonts, 22,000 clip-art images, and 100 high-resolution photos on three CD-ROMs. While Corel offers a version that includes floppy disks of the application itself, that version is more expensive.

Providing additional fonts is one thing, but really extending the application is another. Lotus 1-2-3, Release 4.0: Multimedia Edition is a CD-ROM version with a far more sophisticated help engine than that found in the standard floppy disk version. This engine includes tutors and help screens incorporating graphics and animation, as well as extras such as Lotus' ScreenCam utility. Microsoft Multimedia Works, CD version, adds more help to its popular low-end integrated application. Such efforts are few and far between, however, and most seem to emphasise flash over substance.

CD-ROM-based applications do involve some complications and compromises. You'll still probably want to install the main part of an application on your hard disk because it's much faster than a CD-ROM drive. Still, 600M is a lot of capacity for something that effectively replaces the floppy disk in terms of software distribution.

Developers have always found something to do with extra capacity.

Extensive help systems, animated tools, and additional fonts and clip art are just the beginning.

Michael Miller

Helix Software produces Multimedia Cloaking (available from Intelitron (07) 856 0072 for \$180) software that uses the technology employed in its NetRoom memory manager product to free up lower-memory space that's clogged with drivers for your mouse, CD-ROM drive, and disk cache.

CD Essentials is a Windows-based utility, from Phoenix Technologies, that will automatically catalogue your CD-ROMs and load a CD as soon as you place it in the drive bay. It costs \$229 and is distributed by Light Years Ahead on (02) 477 6666.

CD Power Pak, from Corel, includes software to catalogue your CDs, speed up your CD-ROM drive and record and edit sound files. (Contact Webster Publishing (02) 975 1466. It costs \$149.)

Perusing the number of titles available today can be daunting. In fact, there are CDs that contain nothing but lists of all the titles currently in print, such as TFPL Publishing's The CD-ROM Directory. (Available for \$299 from Firmware Design on (047) 21 7211).

And as the number of titles grows almost daily, so does vendors' understanding of the technology. By the time you read this, it's entirely possible that there will be new CD-ROMs that better utilise your system's resources and provide even more information and entertainment than those available on our list.

GENERAL REFERENCE

Reviews by Rubin Rabinovitz

Grolier Multimedia Encyclopedia

Looking for the best electronic encyclopedia? If best means the most accurate and comprehensive, choose New Grolier Multimedia Encyclopedia. This disk is based on the 21-volume Academic American Encyclopedia, many of whose 2300 contributors are authorities in their fields.

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The latest edition offers 15 animated multimedia maps on such topics as the growth of American railroads, the development of the women's suffrage movement, and the progress of the Gulf War.

Microsoft Encarta Multimedia Encyclopedia may offer more dazzle, but this encyclopedia provides the most information. \$299.95; from Advanced Multimedia Distributors (03) 374 1410.

Microsoft Bookshelf

Connect a search engine to a bunch of reference works and let users retrieve data from a number of these works in a single pass: That's the inspired idea that made Microsoft Bookshelf a CD-ROM hit back in 1987.

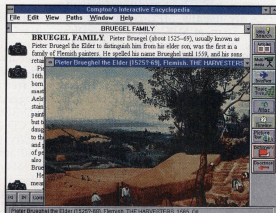
The same idea is at the heart of Microsoft Bookshelf 1994 Edition, along with some of the original reference works: The Concise Columbia Encyclopedia (15,000 entries and 1300 images), the Hammond Intermediate World Atlas (more than 100 political and topographic maps), and the World Almanac and Book of Facts (recently updated for 1994).

New to Bookshelf is The People's Chronology, a year-by-year survey of historical, cultural, and scientific events. One somewhat questionable enhancement is the substitution of the 18,000-entry Concise Columbia Dictionary of Quotations for the classic Bartlett's Familiar Quotations, with its 22,500 entries.

The American Heritage Dictionary now has many more entries, but its operation has become more cumbersome. Roget's Thesaurus is also bigger,

with 250,000 synonyms, though many terms are not exact synonyms. Based on the sheer wealth of reference material included, Microsoft Bookshelf 1994 Edition is very much a program worth having. \$99; from Microsoft on (02)870 2200.

Compton's Interactive Encyclopedia



The camera icons in Compton's Interactive Encyclopedia allow you to display illustrations that are linked to topics discussed in the text

If you think the best CD-ROM encyclopedia is the one that's best for kids, get Compton's Interactive Encyclopedia. It's easy to use, and its content — 5200 feature articles and 28,000 shorter articles — is designed to be understood by children as young as six.

A unique feature in Compton's Interactive Encyclopedia is an integrated dictionary: When young readers don't understand a word, they can simply double-click on it for a definition. This product's multimedia amenities include over 7000 pictures, 800 maps, 50 minutes of audio, and 12 animations on topics such as the amoeba, how birds fly, asexual reproduction, chemical reactions, wind carrying pollen, and nuclear fission. It also includes 60 entertaining and informative video clips on subjects as wide-ranging as cell division and the civil rights movement.

Though it doesn't support Boolean searches, Compton's Interactive Encyclopedia has nine entry paths to help you find out-of-the-way information. For example, initiating a search for the word design using the InfoPilot retrieval utility gives references to articles on industrial design and fashion design, along with the names of famous designers and architects. \$229; from Light Years Ahead (02) 477 6666.

Oxford English Dictionary

The 20-volume Oxford English Dictionary, Second Edition, is the second-best dictionary ever compiled. The best is the Oxford English Dictionary, Second Edition, on CD-ROM.

This disk contains the full text of the printed version: 616,500 words, 137,000 pronunciations, 249,000 etymologies, 2.4 million illustrative quotations, and 577,000 cross-references. Data access is provided by a powerful search engine and a query-language retrieval program that let you gather data in ways you can't with printed dictionaries.

You can conduct wildcard searches, jump to cross-references, filter search results by date or part of speech, and conduct searches. For more complex searches, however, you'll need to invest some time in learning the program's query language.

This product is a word lover's dream, but in view of the \$1595 price, many word lovers won't see that dream become a reality. \$1595; from Light Years Ahead (02) 477 6666.

Microsoft Encarta

Searching for a CD-ROM encyclopedia with killer multimedia features? Look no further: Microsoft Encarta Multimedia Encyclopedia is tops in this category. No CD-ROM encyclopedia can match its numbers: over 7300 images, eight hours of audio, and 100 video clips and narrated animations — plus numerous photographs, maps, charts, foreign-language samples, instrument sounds, animal cries and a time line. You can watch demonstrations of how an internal combustion engine works and how bees use dance to communicate. You can also enjoy the works of Leonardo da Vinci, Picasso, and Rembrandt, or listen to excerpts from Bach, Beethoven, and Mozart.

Encarta's 26,000-article text never reaches the high standard set by its multimedia features, but no other encyclopedia provides the full CD-ROM experience offered by this disk. \$249; Microsoft (02) 870 2200.

Global Explorer

Global Explorer covers the world from all angles. From the broadest perspective, you see the world; at the most microscopic, you see streets in major cities. In between, you get the best-looking, most detailed online maps of the world. Global Explorer includes descriptions of 20,000 historical and geographical features, and street maps for 100 cities. \$249; Light Years Ahead (02) 477 6666.

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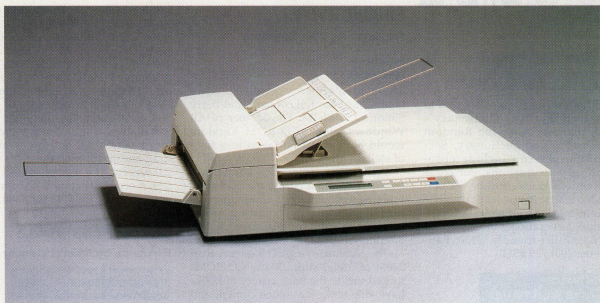


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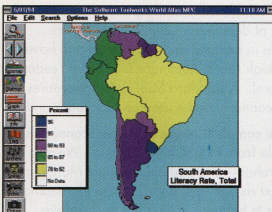
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Random House Unabridged Dictionary

If its 315,000 entries seem paltry next to the Oxford English Dictionary's 616,500, that's because the Random House Unabridged Dictionary, Second Edition, doesn't include obsolete terms and expressions. For some users, Random House will be the better choice because it's easier to use. The definitions may be a bit terse, but Random House's operation is intuitive, and its price is wallet-friendly. \$150; Random House (03) 729 5511.

The Software Toolworks World Atlas

The maps in The Software Toolworks World Atlas, Version 4.0, aren't as detailed as Global Explorer's, but this program does include over 1000 colour photos, 270 film clips, and audio clips with country-name pronunciations. And if all this data overwhelms you, you can look at the flags of 200 countries while listening to each country's national anthem. \$79.95; Mindscape (02) 899 2277.



The Software Toolworks World Atlas has hundreds of statistical maps that illustrate social and economic conditions in different regions

Library of the Future

You'd need an 18-foot floor-to-ceiling bookcase for printed editions of the 1750 volumes in the Library of the

Future, Third Edition. What makes the program doubly useful is a search engine that lets you sift through its many works of fiction, poetry, history, politics, science, religion, and ethics. \$249; Light Years Ahead (02) 477 6666.

PRODUCTIVITY

Reviews by Jim Seymour

CD-MOM

There aren't many good Windows books, but Woody Leonhard and Barry Simon's CD-MOM: The Mother of All Windows Books, CD-ROM Version, would have stood out even in a field of stellar entries.

Witty, idiosyncratic, sometimes cranky, and often corny, the book captures the feeling of a Windows expert sitting at your elbow, chatting away, listening to your complaints, agreeing, offering solutions.

The accompanying CD has more than 240M of useful stuff. (Many CD-ROMs tucked inside the back covers of books have one-tenth that much content and use only a small fraction of the disk's capacity.) And though there are 20 program demos of questionable value, there's also a complete copy of Darian's WinSleuth Gold, WinCIM, and the usual CompuServe free-time sign-up offer, plus 5000 icons, 100 pretty good shareware fonts, and 100 'hand-selected' shareware programs — selected, one assumes, by shareware expert Simon, because this is an A+ list.

The one thing missing is the text of the book itself. It would have been a big job to move the book's thumbnail sketches into the digital domain, but it would have been a pleasure to use CD-ROM's search capabilities. \$69.95; Addison-Wesley (02) 878 5411.

Corel Gallery

There's a huge pile of clip art out there, but much of it is primitive, ugly, out of date and badly organised. And clip art on floppy disks is tough to use: Either you fill up your hard disk with megabytes of art, most of which you'll never use, or you do the floppy shuffle every time you want to use an image.

CD-ROMs and clip art were made for each other: everything in one place, indexed, and instantly available. Corel Gallery lives up to that promise with 10,000 very nice clips — most in colour

— with a printed, colour directory of all the images. (Those publishers that don't include complete printed references with their clip-art packages ought to be roasted on a spit.)

Corel Gallery includes flags and maps galore, famous people, great borders and page corners, international symbols, and much more. Though its images are duplicates of those found in CorelDRAW, you'll want Corel Gallery, too, because its images are immediately useable in all your apps, without translation from CorelDRAW's CDR format.

Corel Gallery also offers easy (if slow) installation, a thumbnail viewer, keyword searching, and quick and easy drag-and-drop; moreover, it's an OLE 2.0 server. At a recommended price of \$99, Corel Gallery is a screaming bargain. \$99; Merisel (02) 882 8888.

DEVELOPERS' TOOLS

Reviews by Sheryl Canter

Microsoft Developer Network, Level 2

If you're interested in developing for Microsoft operating systems — non-trivial stuff like DOS and Windows — then you'll want to subscribe to the Microsoft Developer Network, Level 2, a comprehensive resource from Microsoft that consists of two pieces. The Development Library, Disk 7, is a collection of books, technical notes, white papers, product documentation, sample code, and other useful information. The Development Platform, April 1994, adds the Microsoft Software Development Kits for Object Linking and Embedding (OLE), Open Database Connectivity (ODBC), Win32, and other products; it also includes pre-release versions of Microsoft operating systems such as Windows NT, Version 3.5.

This program offers quality information, and navigation is made easy via the Microsoft Multimedia Viewer. Topics can be printed, copied, and annotated. Annotations appear as little red paper clips in the upper-left-hand corner; click on a paper clip to view an annotation.

You can search for keywords within a topic, and there is also a powerful engine for searching through the entire library. Cross-topic searching supports full Boolean logic, and retrieval is very fast. Bookmarks let you jump quickly back to topics of interest. Finally, the online help system is as comprehensive as the library itself. \$948; Microsoft (02) 870 2200.



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Micro House Technical Library

Micro House Technical Library offers CD-ROM versions of three publications from Micro House: The Encyclopedia of Main Boards, The Encyclopedia of Hard Drives, and The Network Interface Technical Guide. The books describe the technologies and list specifications and manufacturer information for thousands of devices — essential reference material for technology junkies. \$960; MicroGram (043) 34 1544.

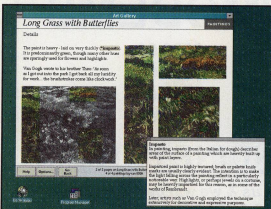
ART AND MUSIC

Reviews by John Quain

Microsoft Art Gallery

When it comes to art, most people subscribe to the "I don't know how to define it, but I know it when I see it" school of thought. Microsoft Art Gallery certainly enables you to see a lot of it — and may change how you think about painting.

Based on the National Gallery of London's collection of 13th to 20th-century paintings, Microsoft Art Gallery beautifully presents the lives of the painters, an historical atlas, and four narrated tours. It also has practical help, such as spoken pronunciations; there's no excuse for mispronouncing Ingres or *trompe l'oeil* anymore. Microsoft Art Gallery's paintings are hyperlinked to other related works — an advantage this medium has over typical museums.



Microsoft Art Gallery's paintings are adroitly and beautifully handled on-disk, allowing you to explore the paintings at your own pace

There are limitations, however. Much of the material only scratches the surface. Microsoft Art Gallery won't tell you about the controversy surrounding Velasquez's *The Rokeby Venus*, and because it's based on a single art collection, its coverage is limited. Also, the images don't match the detail of photographs in a good art book. Van Gogh's brush strokes look smudged, and the point in Seurat's pointillism is blotchy. But what this disk lacks in completeness and detail, it makes up in its elegant yet easily navigated presentation. \$115; Microsoft (02) 870 2200.

Exploring Ancient Architecture

Goethe once called architecture "frozen music." Exploring Ancient Architecture, from Medio Multimedia, sets that music in motion with impressive 3-D animation.

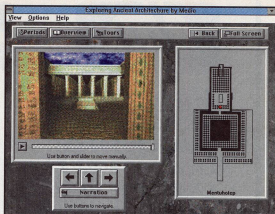
Covering four eras — the Neolithic, Egyptian, Greek, and Roman — this disk uses multimedia effects to recreate architecture none of us can ever visit. Each period is covered by an overview using slides and models, while the narrator delivers a thumbnail sketch of the era's crowning architectural achievements. The overviews can be tedious, but the real gems are the building tours.

The seven building tours allow you to become a virtual tourist. In the Neolithic period, for example, you can wander through Stonehenge, which actual tourists are no longer allowed to do. Furthermore, buildings long since destroyed (such as the Temple of Khons) are recreated for you to stroll through.

Other aspects of the disk suffer from a lack of creativity. The navigation controls are stifling, and search mechanisms are nonexistent. In addition, the narration sounds like a sixth-class history-lesson film. As a reference tool, Exploring Ancient Architecture is merely a coffee-table book; still, it's a great coffee-table book. \$99.95; Advanced Multimedia Distributors (03) 374 1410.

Microsoft Multimedia Schubert

Voyager wrote the CD-ROM on how to create top-notch multimedia titles. The company is responsible for an entire line of superlative classical CD-ROMs (sold through Microsoft), includ-



A virtual tour of Ancient Egypt's Temple of Mentuhotep is just one of the 3D animations included in Exploring Ancient Architecture

uding Multimedia Schubert: The Trout Quintet, a disk that represents the pinnacle of Voyager's series so far.

Schubert's lyrical quintet is a masterpiece that requires no introduction, but this disk manages to illuminate the music without stepping on it or boring the user. Most of the credit goes to music critic Alan Rich, who does an excellent job bringing Schubert's music to life.

Though other classical music CD-ROM titles often come off as dry or disorganized, Rich's homespun eloquence strikes the right chord, conveying his obvious enthusiasm for the quintet and instilling in the listener a new appreciation for this subtle piece of music. The material is well written and interspersed with lively quotes and anecdotes that prevent it from slipping into mere pedantry.

Highlights of the disk include articles and slides that take us through 1819 Vienna and Schubert's short life. It also has an intriguing close reading of the work, complete with a performance by Elizabeth Leonskaya and the Alban Berg Quartet. \$115; Microsoft (02) 870 2200.

Poetry in Motion

"Poetry's always been said to be a private hidden art, not appreciated," said Charles Bukowski. Poetry in Motion successfully dispels this myth by turning poetry from something read alone at home or in a library into something heard and seen on a PC.

Filed by Ron Mann, Poetry in Motion contains 24 contemporary poets reading from their work. Additional interviews are included for most of the authors. Although the video plays in tiny windows, the readings bring the works alive, revealing intonations a solitary reader might not otherwise notice. The poets range from the famous (Allen Ginsberg) to the relatively unknown (Chris Dewdney)

SHOPPERS' GUIDE

to those more widely known for their music (Tom Waits and the late John Cage). Voyager has made the user controls on this disk as unobtrusive and flexible as possible, with sound-level and play-back buttons neatly hidden behind the words and images. \$79; Light Years Ahead (02) 477 6666.

Prince Interactive

Beyond guessing how to pronounce Prince's new legal name, this disk will leave you wondering: Is it a game? Is it an aural puzzle? Or is it a musical experience? The answer is that it's all of these and more. Decked out in lush graphics, Prince Interactive takes you into Prince's imaginary boudoir, library, music studio, and private club.

Throughout, you pick up clues to play videos and collect pieces of the Prince symbol. The disk contains four full-length music videos, including two new songs: 'Interactive' and 'Endorphin Machine.' The sound quality doesn't match that of a standard audio CD, but this music exemplifies his playfulness and ingenuity.

The music studio has a karaoke version of 'Kiss,' and in the private club Eric Clapton, Little Richard, George Clinton, and Miles Davis opine about the Symbol Man. Even if you think Prince's music has never been on the cutting edge, this CD-ROM opens new doors for popular music and multimedia. \$89.95; Dataflow (02) 310 2020.

Microsoft Multimedia Stravinsky

Not all symphonic music has a calming effect. Stravinsky's *The Rite of Spring*, for example, caused a riot when it was first performed in 1913. Ever since then, audiences have found this seminal composition interesting but often difficult. On Microsoft Multimedia Stravinsky: *The Rite of Spring*, UCLA music professor Robert Winter manages to make *The Rite of Spring* much more accessible.

Employing an array of multimedia techniques, Winter offers insights and brings a cohesion to Stravinsky's famous work that listeners might not otherwise discover. There's an aural tour of the

orchestra, notes on Nijinsky's ballet, a biographical sketch of the composer, and even a game.

Relatively sophisticated classical music buffs will appreciate Winter's close analysis, which takes you through Charles Dutoit's Montreal Symphony Orchestra performance note by note and instrument by instrument. \$115; Microsoft (02) 870 2200.

A Hard Day's Night

Little did Richard Lester realise in 1964 when he began filming *A Hard Day's Night* that it would influence rock videos 30 years later. In case you haven't seen the Fab Four's movie in a while, this Voyager disk shows what an impact the movie and the band have had on subsequent generations. Furthermore, this full-length digitised version of *The Beatles* movie is an excellent history lesson for kids who think Pearl Jam invented rock and roll.

Coupled with the movie, which plays best in a small, 2 by 2.75in window, are Beatles' biographies, a lengthy commentary, a photo library, and the original script. Extras include the movie's original trailer (replete with screaming prepubescent girls), two of Lester's early films (a short and a clip from a feature), and, of course, all the movie's songs. \$69.95; Firmware Design (047) 21 7211.

Beethoven's 5th

Perhaps no music is more recognisable than the opening strains of Beethoven's Fifth Symphony, but this exploration will enhance your appreciation of its grandeur. Beethoven's 5th: The Multimedia Symphony includes video clips of musicians, a section on the instruments, and the entire score, with a performance by the Zagreb Philharmonic under Richard Erdinger. This well-rounded disk should pique your interest in the Fifth beyond da-da-da-dum. \$74.95; Roadshow Entertainment (02) 552 8600.

I Photograph to Remember

I Photograph to Remember is Latin American photographer Pedro Meyer's exquisite black-and-white homage to his parents. Told in his own images and narration, this work brings into the home on a single disk what many museums can't achieve in an entire exhibit —

more personalised contact with the artist. \$89.95; Advanced Multimedia Distributors (03) 374 1410.

HISTORY

Reviews by Ruben Rabinovitz


Time Almanac of the 20th Century

There's no time like the present. *Time Almanac of the 20th Century's* 2000 articles, 500 photos, and 40 minutes of video — all of good quality — provide a colourful decade-by-decade introduction to recent history. Narrated photo essays such as 'Russia, the Death of the Dream' compare the USSR of the 1930s to the disintegrating Soviet Union of the 1990s.

Time Almanac of the 20th Century also contains maps, graphs, a time line, statistical tables, 12 photo essays on key 20th-century figures, and extensive coverage of all presidential elections since 1924. Additional material includes *Time* 'Man of the Year' stories and original cover art since 1927, and *Newsquest* — a game to test your knowledge of 20th-century history.

There's a great deal of essential information here for those interested in recent history. \$279; Light Years Ahead (02) 477 6666.

MAKING BOOKS



Who Made Books in Anglo-Saxon England? continued

Members of the lower classes could gain an education by joining the Church as trainee priests, monks, or nuns. Schools were generally within monasteries, although royal and noble households might have their own tutors, and parish priests and mothers also played a role in educating young people.

Press the continue button to see how books were made in Anglo-Saxon times

Beyond including the texts of books from early England, *The Anglo-Saxons* describes how books were made in that era

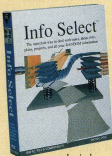
The Anglo-Saxons

Recent discoveries have helped us learn more about life in early Britain. The Anglo-Saxons, developed in cooperation with the British Museum, conveys this information in a most attractive way. You can listen to Anglo-Saxon music, tackle Anglo-Saxon riddles, look at pictures of imaginary beasts, learn about the lives of British kings, find out about life in the monasteries, and get suggestions for places to visit if you're planning a trip to England.

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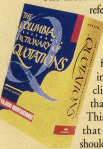
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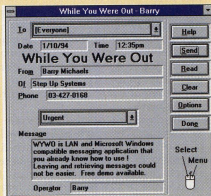
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You'll find fascinating illustrations of relevant artefacts, weapons, and manuscripts from the British Museum's extensive Anglo-Saxon Collection and other collections. The Anglo-Saxons also features quizzes based on the included material. Anyone studying medieval history, art, and architecture will not only learn a great deal from this program but will enjoy using it. \$89.95; Advanced Multimedia Distributors (03) 374 1410.

Microsoft Ancient Lands

Microsoft Ancient Lands provides a multimedia introduction to the glory that was Greece, the grandeur that was Rome, and the wonder that was Egypt. The disk contains over five hours of narration, music, and sound effects as well as 21 animation and video sequences.

Microsoft Ancient Lands is informative enough for adults and entertaining enough for kids. \$115; Microsoft (02) 870 2200.

SCIENCE

Reviews by Barry Simon

Isaac Asimov Science Adventure 2

Isaac Asimov Science Adventure 2 is noteworthy for its spectacular computer graphics and the high quality of its articles, which are based on Isaac Asimov's *Chronology of Science and Discovery*. Although coverage of the material is not very deep, the disk embraces a wide range of topics and includes myriad slick animation demos, from roller-coaster acceleration to planetary orbits to a pulley demonstration. It also features several games.

The central mode of the program is its reference screen, where text panels, pictures, a time line and a globe are displayed. With a click of a button, you can switch the text panel from adult to child mode, which contains less information and an easier vocabulary. All areas are hyperlinked to other topics.

Isaac Asimov Science Adventure 2 has a highly graphical interface, which actually is often counterproductive. The icons are very cryptic, making user navigation difficult. The initial



Knowledge Adventure's Isaac Asimov Science Adventure II features a reference screen with linked text and pictorial boxes

area, for example, is a 3-D lobby in which all the icons are pictures hanging on the walls. It's attractive but not very intuitive. Nevertheless, this is a wonderful program for introducing children to the world of science. Their parents can learn a lot as well. \$99.95; Advanced Multimedia Distributors (03) 374 1410.

Bodyworks

The Windows-based Bodyworks, Version 3.0, is a superbly designed, comprehensive anatomy reference with wonderful supporting multimedia. From a button bar or menu you choose one of the top-level body systems: skeletal, muscular, nervous, cardiovascular, respiratory, digestive, sensory, lymphatic, endocrine, or genitourinary. The window then shows the appropriate diagram; you can focus on individual organs by clicking either on the diagram or on an adjacent scrolling list.

Click on the mouth in the skeleton, for example, and a close-up view of an open mouth appears, complete with teeth, tongue, and epiglottis. There is a text description with hyperlinks to other articles and a glossary. The clear colour diagrams (over 140 of them) are supplemented by 14 3D models and 37 videos and animations. The 3D area has a couple of nice surprises. The models can be shown as wireframe, smooth, or angular. All can be rotated, even the simple 3D models which are redrawn in real time as you move them. Among the multimedia movies included on the CD-ROM are the brief 'A Firing Synapse', the mildly disgusting 'Chewing and Swallowing', and the inspiring and surprisingly complete 'Childbirth'.

Lessons and tests are also included. This is an ideal program for high-school students and others who are interested in anatomy. \$99.95; Dataflow (02) 310 2020.

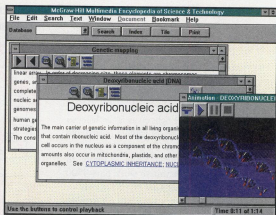
McGraw-Hill Multimedia Encyclopedia of Science & Technology

The McGraw-Hill Encyclopedia of Science & Technology has become a standard reference source for everyone from college students to professional scientists. The disk version is filled with the

same quality information written by distinguished scientists, and its powerful search engine will make you wonder why you ever had to bother searching through the massive tome for particular words or subjects.

The best part about this disk is the ability to browse with hyperlinks; the product uses a multiwindowed interface that keeps prior articles in view. It also includes 39 animations and about 500 illustrations that enhance the product but are not outstanding. The biographical list is noted for its glaring omissions (for example, Pierre Curie is missing), but the glossary is very good.

This disk won't dazzle you with multimedia pyrotechnics, but you'll love the ability to conduct hyperlink searches through such an important reference. \$2500; McGraw-Hill (02) 417 4288.



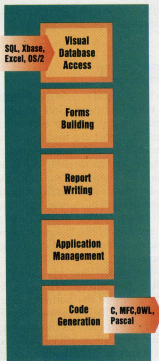
The McGraw-Hill Multimedia Encyclopedia of Science & Technology's interface lets you browse with hyperlinks and easily run animations

Expert Astronomer

Expert Astronomer is a cornucopia of delights for the astronomy fan. It includes a planetarium that lets you see how any part of the night sky looks and over 500M of stunning pictures and

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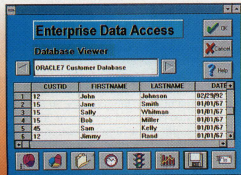


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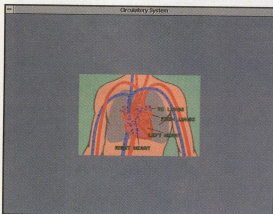
SHOPPER'S GUIDE

engrossing information, with 40 minutes of entertaining videos.

For astronomy buffs, this is the CD to buy. \$69.95; Dataflow (02) 310 2020.

Mayo Clinic Family Health Book

Mayo Clinic Family Health Book includes several dozen animations, 500 illustrations, and 90 minutes of narration, but the most important element is the superb 1400-page book. The pop-up dictionary, hyperlinks between articles, and text-search capabilities take this work far beyond a printed text. The disk also includes a colour atlas of human anatomy. \$98; Captain CD-ROM (03) 545 0400.



The Mayo Clinic Family Health Book includes detailed diagrams, such as this one of the heart

ENTERTAINMENT

Reviews by Donald Trivette

Sim-City CD-ROM

Whether you're a man, woman, or child, how can you resist being the Mayor of Sim-City? You plan, build, manage, and maintain a city from the ground up. If you do well, your city will prosper; if not, you'll end up with Sim-Slum.

In Sim-City you build houses, industrial areas, power plants, and roads. As the population grows, you need more utilities, a seaport, a stadium, new commercial districts, a park or two, and, of course, higher taxes. A

cantankerous collection of city dwellers are always beating on your office door demanding more police officers, fire stations, and affordable housing. To keep you on your toes, the simulator throws in a few surprises — a fire here, a tornado there. Before you know it, the budget is shot and you need money to build a new power plant.

Construction is easy: Click an icon and drag it to the city map. The accompanying sound effects of jackhammers and bulldozers add to the realism. When disaster strikes, a video window opens and you are there. Meanwhile, the audio help feature is constantly nagging: "Put commercial zones near the residential areas. Build more affordable housing." Sounds a lot like a city council.

Sim-City is the Lego blocks of the computer generation and splendid entertainment for the whole family. \$99.95; Sega/Ozisoft (02) 317 0000.

King's Quest VI

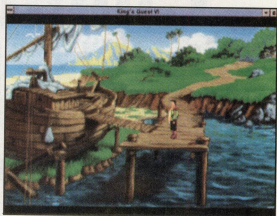
King's Quest VI: Heir Today, Gone Tomorrow continues the saga of the Graham family, as young Alexander seeks the hand of the fair princess Cassima. Though darker and more ominous than earlier quests, the action and production values nevertheless demonstrate how good multimedia adventure games have become.

A 50M animated cartoon introduces the quest and ends with Alexander shipwrecked on one of the Green Islands. He quickly learns that Cassima is not only on this very island but betrothed to the wicked Vizier. Of course, adventure and mishap follow as Alex searches for a way to rescue his true love.

The story is full of the witty and bizarre characters that are hallmarks of King's Quest games. There's a particle dangling from a tree, a barking dogwood, a head of iceberg lettuce (you need it to cool a steaming pond), and a delightful group of five animated gnomes, each of which specialises in one of the five senses.

Sierra has developed a truly friendly user interface. There is nothing to read and nothing to type in the CD-ROM version; all dialogue is spoken by professional actors. And by using the point-and-click interface, even a six-year-old can move through the pro-

gram with ease. \$89.95; Sega/Ozisoft (02) 317 0000.



Alexander cautiously approaches a derelict ship in search of clues to help him rescue the lovely Cassima in King's Quest VI

Microsoft Golf

Can't get to the golf course this evening? Tee up with Microsoft Golf and hook, slice, drive, and putt your way around 18 holes. It won't do much for your waistline, but it certainly is a lot of fun.

The holes are spectacular. No artist's renderings of make-believe links here; instead, the disk offers digitised images of the real thing. SVGA graphics clearly show the undulations of the fairways and the textures of the trees with a photographic realism not found in other golf simulations.

The whoosh of a long drive, the clunk of a ball in the cup, and the splash of water are a few of the authentic sound effects. But the full-motion video is what really distinguishes this multimedia version from other golf games. Every hole has a full-motion fly-over to give you a bird's-eye view of the lay and location of the fairway, bunkers, traps, and green. More video is available in the pull-down window, where a pro gives tips on how each hole is best played. Access Links courses are compatible with Microsoft Golf, but you won't have the fly-overs and pro tips. \$95; Microsoft (02) 870 2200.

Microsoft Cinemania

Microsoft Cinemania '94 is a film buff's dream. With still shots, sound bites, cinema history, biographies, 20 full-motion video clips, and reviews of 20,000 films, it's like munching hot buttered popcorn with Bill Collins, David Stratton and John Hinde. Video clips last from 30 to 90 seconds and are among the smoothest to be found on CD-ROM. About 150 audio clips and 900 movie stills round out the multimedia material.



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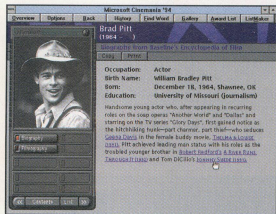
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Film clips, audio clips, publicity stills, biographies, and reviews of 20,000 films make Microsoft Cinemania the ideal companion for movie buffs.

The software uses a graphical interface in the guise of a remote control. Push the contents button to get a list of films from 99 *Women to Zuma Beach*. Double-click a title to see its running time, awards, and media format. Every film has a corresponding review, and the more important films feature reviews by several critics as well as complete cast lists. The contents screen lets you filter films by 11 categories, including genre, actor, director, date, and awards.

Hyperlinks abound. While scanning a review of *A River Runs Through It*, for example, you can click on Brad Pitt's name to call up the actor's photograph and biography. The biography mentions *Johnny Suede*; click on that and you get a review of the 1991 sleeper. Almost everything in Cinemania is interconnected.

If you love movies, you'll love Microsoft Cinemania. \$115; Microsoft (02) 870 2200.

Star Trek: 25th Anniversary

Star Trek: 25th Anniversary CD-ROM places you aboard the USS Enterprise in the role of Captain James T. Kirk with the crew of the original TV series. Your missions alternate between solving intergalactic puzzles and doing battle with Romulans and Klingons. The disk features the voices of William Shatner and Leonard Nimoy. It's a great sequel to the TV show. \$109.95; Sega/Ozisoft (02) 317 0000.

Dracula Unleashed

Dracula is stalking blood donors in turn-of-the-century London and you, as the brother of a victim, must try to stop him. More than 90 minutes of video and 50 minutes of sound lead you from one clue to another. Are you smart enough to put all the pieces of this dazzling multimedia puzzle together before it's too late? \$89.95; Sega/Ozisoft (02) 317 0000.

Iron Helix

In *Iron Helix*, you control a robot aboard a crewless spacecraft on a collision course with a populated planet. Aboard is *Iron Helix*, the ultimate Doomsday weapon. Your objective is to find the DNA of an officer with high enough rank to allow you to fool the defender robots and reprogram the spaceship's course. *Iron Helix* contains about an hour of detailed animation. \$120; Electronic Arts (075) 911 388.

The Software Toolworks' Star Wars Chess

This is not your father's chessboard. In *The Software Toolworks' Star Wars Chess*, Luke Skywalker matches wits with the Emperor as a host of other characters—including R2D2, Yoda, and Darth Vader (as a queen)—play supporting roles. Each capture has its own animated wipeout accompanied by sound and music from the *Star Wars* films. \$89.95; Mindscape (02) 899 2277.

Return to Zork

Return to Zork combines an unusually friendly mouse interface with a host of live actors to draw you effortlessly into the action. You quickly forget that you are out to save yet another world (the Underground Empire of Zork) from yet another villain (the IT&L Corp) and begin to enjoy *Return to Zork* for what it is: a first-class cinematic adventure. \$99.95; Activision (02) 869 0955.

Sam & Max Hit the Road

Sam & Max Hit the Road is a witty trip through the tourist traps of America with the laid-back Sam and the thrill-seek-

ing Max as they search for Bruno the Bigfoot and Trixie the Giraffe-Necked Lady. The offbeat humour and sarcastic one-liners are a refreshing change from usual adventure game fare. \$60; Metro/Playcorp (02) 329 2999.

Sherlock Holmes Consulting Detective

Sherlock Holmes Consulting Detective, Volume Three, is the latest in the popular series that pits Holmes and Watson against the criminals of London. Use the hour of interactive video—sometimes comically overacted—to interview suspects and witnesses. Listen to the Baker Street Irregulars and scan *The Times* for clues. Once you're sure of your facts, present them to the judge. The disk contains three unrelated mysteries, all of which should satisfy any mystery buff. \$89; Light Years Ahead (02) 477 6666.

Rebel Assault

Punctuated with video and original music from the *Star Wars* trilogy, *Rebel Assault* is an arcade's delight. Pilot your skyhopper from training missions in Beggar's Canyon to an encounter with the Death Star. There's no better blend of action, music, sound effects, and dialogue—but you may need some hardware tweaking to get it to work. \$66; Metro/Playcorp (02) 329 2999.

Comanche CD

Comanche CD is an excellent simulation of the Boeing Sikorsky RAH-66 helicopter gunship. The terrain representation and rich visual detail put Microsoft Flight Simulator to shame. \$99.95; Sega/Ozisoft (02) 317 0000.



The Wizard speaks in the underground multimedia adventure game *Return to Zork*.

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EDUTAINMENT

Reviews by Gayle C. Ehrenman

Lenny's MusicToons

Lenny may seem like just another penguin to you, but to your kids, he'll seem like a musical genius. After all, Lenny is no ordinary penguin; he's the bird who can take kids aged four and up through the land of MusicToons, where just about anything can happen.

This musical cartoon adventure helps children learn musical skills and concepts through exciting animations, interactive exercises, and fun arcade games. The graphics are vivid, the music pulsing, and the learning deftly hidden beneath the fun.

But your kids won't care about any of that. All they'll care about is staging their own concerts to debut in Lenny's Theatre and producing their own music videos for PTV (Penguin Television). While they're choosing the stars, and types of music for their videos, kids will also be learning about tempo and composing. They can even record their video productions and play them back for their adoring parents.

For more musical fun, kids can try their hands at Pitch Attack — a shoot-'em-up game in which hitting the right key on the keyboard saves the world — or Lenny's Puzzle Book, where unscrambling a musical puzzle saves Lenny's cat from Gonzo Gorilla, a simian gone wrong.

After Lenny, your kids may even want to practice the piano. \$69.95; Sega/Ozisoft (02) 317 0000.

Arthur's Teacher Trouble

Third grade can be hell — especially if you have the toughest teacher in school. Thus begins the school year for our hero, Arthur, who discovers not only that he has "The Rat" for a teacher, but that he must represent his class in the schoolwide spelling bee as well.

Kids aged six through 10 will quickly become involved in the traumas and triumphs of this animated aardvark as he wends his way through an engaging interactive tale, the second in the Living Books series. Like its predecessor, Just

Grandma and Me, Arthur's Teacher Trouble offers kids a chance to explore while they read. There are singing and dancing characters to enjoy, sound effects, original music, lots of humour to giggle over, and plenty of beautiful animations that can be launched with a single mouse click.

While they're exploring, kids will be building their reading skills, and they can hear individual words or whole sentences pronounced in either English or Spanish. There's even a printed copy of the book included for times when no computer is handy.

Marc Brown's story is truly delightful, as are the animations used in its telling. This isn't just another storybook in digital format; it's a whole new way for kids to play and learn. \$79.95; Dataflow (02) 310 2020.

Prehistoria

Dinosaurs may get all the glory, but they weren't the only creatures roaming prehistoric Earth. This disk, devoted to all forms of early life, provides a multimedia look at everything from flying lizards with wing spans wider than World War II fighter planes to dinosaurs no larger than chickens.

The package provides more than 60 minutes of multimedia content spanning 500 million years of natural history. The material is arranged in five easy-to-access areas: the Gallery, the Creature Show, the Time Tracker, Classifications, and the Grolier Museum.

The Gallery offers groupings of similar prehistoric creatures, while the Creature Show lets you zero in on your favourites through full-colour illustrations and detailed text describing the characteristics of each animal. The Time Tracker allows you to search for particular types of creatures in any of 11 geological eras, while the Grolier Museum is where you'll find narrated videos and audiovisual essays on palaeontology, prehistoric life, and more. To make it even easier to find that certain Diprotodon (a rhinoceros-size marsupial resembling a wombat), there's also a classification list.

Kids aged 10 and up will find that researching has never been easier — or more attractive. \$149; Advanced Multimedia Distributors (03) 374 1410.

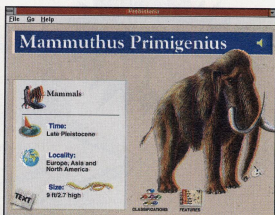
Kid Works 2

Buy your children Kid Works 2 and they'll have no excuse for not being cre-

ative. Combining a paint package with a word processor and text-to-speech capabilities, Kid Works provides the perfect environment for kids aged three and up to try their hands at writing and illustrating their own stories.

Kids compose text in Story Writer, a simple word processor with a couple of unique capabilities; it uses a simple kiddie font for display, and it can substitute icons for many words. Story Illustrator is the next stop on the creativity train; it's here that kids create the pictures to accompany their words, or they can use the paint tools to colour in an electronic book. When they're done creating, Story Player will read the masterpiece aloud.

Kids will love the power this package provides, but they may need a little help figuring out how everything works. \$79.95; Dataflow (02) 477 6666.



Learn about the many life forms that share the Earth with the dinosaurs in Prehistoria

Macmillan Dictionary for Children

This dictionary is a study in simplicity; scroll through the word list or click on 'Go To' to find what you need quickly. Each of the 12,000 words has a definition and an audio pronunciation, and each is hot-linked to other words. Kids can make up their own word lists, too, and then print them or use them to play one of three games. There's not much multimedia glitz, but kids aged seven to 12 will find this indispensable at homework time. \$69; Light Years Ahead (02) 477 6666.

Twain's World

Buy this one for the text — not the multimedia effects. Twain's World contains the complete works of Mark Twain, including his essays, speeches, and letters, all of which are indexed for searching. The Timeline is a powerful tool for tracking the author's life, and the quizzes are

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good study tools. There are few video clips, though, and some of the cartoonish animations are downright offensive. \$89; Light Years Ahead (02) 477 6666.

The Berenstain Bears Learning at Home, Volume 2

These favourite bears are back in a fully interactive journey through their tree house. Here, kids aged two to seven can learn life lessons in home safety, manners and skills such as reading and number recognition. They may need help navigating through the colourful animations and games, though; guide the youngest to keep them from becoming frustrated. \$119; Light Years Ahead (02) 477 6666.

Operation Neptune

If you can decipher the percentage of unhealthy barnacles in a given area, you may be able to save the world's oceans. This underwater adventure builds pre-algebra math skills as it transports you 20,000 leagues under the sea in a challenging and engaging search-and-rescue mission. There is also some arcade action, so while the going may be tough, it's never boring. \$79.95; Dataflow (02) 310 2020.

Math Blaster

The maths fun continues with the latest adventures of the Blasternaut and his

sidekick, Spot. In Math Blaster: In Search of Spot, Spot has been captured, and players must solve a series of maths problems to free him. There are six difficulty levels and thousands of problems to keep kids aged six to 12 busy. The story line is so engaging and the graphics so attractive, solving problems will seem like fun. \$69.95; Dataflow (02) 310 2020.

The New Kid on the Block

Another winner in the Living Books series, this disk explores not a single story but a collection of poems from noted children's writer Jack Prelutsky. Readers click on words to launch some wickedly inspired animations. The poems and animations are so funny, readers aged six through 12 won't be able to help but laugh their way through this joyous introduction to poetry. \$79.95; Dataflow (02) 310 2020.

Rodney's Wonder Window

Beautiful but bizarre is the best way to describe these 24 unique animations, which offer varying degrees of interactivity. There's nothing educational about poking the sleeping animals at the Probe and Poke Pet Shop, or putting various objects up the giant nose, but the interface is a study in simplicity and blowing out the birthday candles will keep little ones busy for hours. \$94; Light Years Ahead (02) 477 6666.

Busytown

Kids aged three to seven will feel at home in this familiar world, based on characters created by children's author Richard Scarry. All their favourite characters are here, encouraging them to participate in learning activities that range from pumping gas to controlling the wind. There are three levels of play to choose from, lots of delightful animations to explore, and an original musical score. If you don't have fun in Busytown, you just don't know how to have fun. \$78; Captain CD-ROM (03) 562 5422.

It's a Bird's Life

In Shelley Duvall's *It's a Bird's Life*, a group of exotic birds journeys from Los Angeles to the Amazon rain forest and back in a digital storybook that is ambitious in scope and modest in animation. The illustrations are beautiful and the story and games engaging

for kids aged three and up. \$59.95; Dataflow (02) 310 2020.

TRAVEL

Reviews by Donald Trivette

Adventures

Adventures will help you plan a holiday even if you initially don't know what you want to do or where you want to do it. Search its database of 1160 activities until you find something exciting. Pick a country and use the pull-down list to scan the attractions. You can also query by activity, selecting from 30 categories, which include aerial sports, biking, economy vacations, and snow sports. Or you can use the custom-search feature to find some of the activities, festivals, and events occurring in a particular month.

You can also use the search feature to generate a list of specialised activities.

Select those adventures classified as 'difficult' and you'll get a list of nine excruciating vacations, including climbing Mount McKinley, trekking at nosebleed altitudes in Nepal, and rafting the Futaleuf River in Patagonia. If those are too tame, touring Hungary on horseback might get your blood flowing.

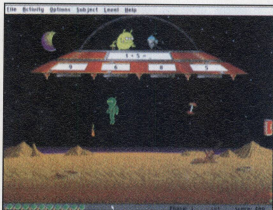
The disk contains about 2500 colour photographs and for each adventure there's a written description. \$69.95; Dataflow (02) 310 2020.

From Alice to Ocean

From Alice to Ocean documents Robyn Davidson's extraordinary camel journey from Alice Springs, Australia, across the expanse of the outback to the Indian Ocean. Directly addressing the viewer, Davidson describes the hardships and dangers of her year-long journey. The armchair traveller can interrupt at any time to view maps or photographs, or to select questions from an interactive menu.

Although the trip took place 15 years ago, the chronicle CD of Davidson's journey first appeared two years ago when it was bundled with 500,000 Apple CD-ROM computers and became a best-seller; the multipatform disk was released last November.

The CD-ROM is bundled with a beautiful 200-page book filled with colour photographs. The disk, however, contains many more photos than the book, all of which are of great quality. This is a fascinating chronicle of a remarkable journey. \$119; Light Years Ahead (02) 477 6666. ▲



In the arcade-like Math Blaster, kids must solve arithmetic problems to save the Blasternaut's trusty sidekick, Spot, from the Trash Alien

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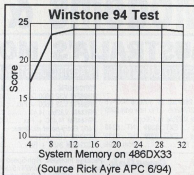
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Coming up December 1994

Roaming wide

Theoretically, the enabling tools for genuine mobile computing are already on the market or are under development; cellular fax modem cards, wireless networks, global communications infrastructure, high-powered notebooks, and software to ease the integration of it all and keep you in contact with home-base.

But the reality of mobile computing is still a Pentium-class headache. APC offers some panadolic advice, reviews a sleigh full of capably configured notebooks for under \$3500, and, if you've been good for Santa, the new Pentium 75MHz road burners.

Consuming PCs

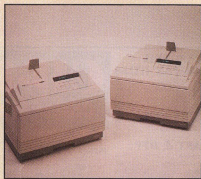
With stats suggesting a surging market, APC analyses the forces pushing PCs and PC products into homes and SOHOs. We survey the driving technologies and their appeal, the strategies of the major PC vendors and software developers to tap the market, cover the size and scope of the market, and sample some of the hot products headed for your PC's Christmas stocking.

Annual printer feature

In the first of our two part printer extravaganza, we review mainstream laser printers, and, in keeping with our mobile cover story, portable printers.

Plus

Processor upgrades, the first full review of DOOM II, the mobile phone market, LapLink for Windows, WinFax Pro 4.0 and much, much more...



Call for nominations: Readers' Choice for the best products of 1994

As part of our December issue, we will be running a vote for **Readers' Choice for the best products of 1994**. The results of this poll will be published as part of our **Best of 94** roundup in the January 1995 issue of APC.

We need our readers' contributions to let us know what you feel were the best new releases throughout the year; the products that you liked, loved, or were just plain useful.

To make this poll as fair as possible, we feel readers should nominate their preferred products in each of the following six categories: PC Desktop Systems and Notebooks; Application Software; Operating Environments and Utilities; Peripherals; Communications and Networking; and Miscellaneous. The top ten products or product families in each category will be listed in the December issue, and we'll ask for your votes.

Please also list the products that you most reviled or loathed!

Send your entries to APC Readers' Choice, PO Box 4088 Sydney 2000, fax to (02) 267 4903, or email to APC@ACP-Sydney.cmail.compuServe.com by 5pm Monday 14 November 1994.

Nomination form: APC Readers' Choice

- 1) PC Desktop Systems and Notebooks
 - 2) Application Software
 - 3) Operating Environments and Utilities
 - 4) Peripherals and Add-ins
 - 5) Communications and Networking
 - 6) Miscellaneous
- Please also nominate your most hated product of the year.....

CHIP CHAT

Staff and contributors report on the lighter side of a month

in the computer industry.

Hyper removal section

We are sometimes accused of being sceptical about the levels of technical hype pushed at us by marketing departments. However, Dell is obviously making a big effort to bring highly technical concepts to the level of everyday users. In a recent press release about energy guidelines, it cleverly avoided quoting percentages, alpha-factors and statistical variations. Instead it rationalised its statements into a very assimilable form. We quote:

"... there are more than four million personal computers currently in use in Australia — that's a lot of power being used." How true. And how understandable.

Amazing news

We've all heard about the lack of love between IBM and Microsoft, but apparently all is now love and kisses. At least, according to one daily's weekly computer section. The special section titled "Will OS/2's Warp be Doomed?" announced the grave news that the future of OS/2 Warp would depend on whether or not it is capable of supporting the latest version of DOOM. As a postscript, the obviously extremely well connected author lists a run down of the major advantages of Warp, with the surprising postscript: "... Microsoft is helping." We just hope Bill Gates knows.

Watch out

A word of caution. According to a mole within a brand leader in the mobile computing market, some makers are cutting corners. Australian retailing standards require that distributors keep stocks of spare parts for up to five years after any particular model was sold. But our mole told us that the cost of this — especially within the ever contracting margins of the fiercely competitive notebook market — means some makers are not doing this. You heard it here first.

Keep in touch

What's this about computers and communications revolutionising our world? Somebody forgot to tell Exabyte. Hot from the hands of our postie, we received notification that Exabyte had moved to a new location in keeping with its status as a major supplier of tape backup drives and tapes. Two days later, the same postie delivered yet another missive from Exabyte, telling us all about its latest mega-storage device. With the old address still listed on the release. Keep in touch with yourself, Exabyte.

Spreading the word

Anxious to use laser-like targeting technology to ensure the maximum coverage for the unveiling of



its new colour LaserJet, Hewlett-Packard pulled out all the stops for the Aussie launch. It flew half a dozen US experts into give top level briefings on the new device. And where did it hold this prestigious national launch? In a small back room in the bowels of the Melbourne Radisson. Adding even more piquancy to the occasion, attendees had to pass massive glitzy displays and promotions being staged by Canon and AST on their way into the back corridors. As a result the attending journo were out-numbered some three to one by HP's experts and staff, and at least half the free rolls went uneaten. Evidently self-promotion is not one of HP's strong points.

Chilli cook-off

Despite the best efforts of the organisers, Micrografx' Chilli Cook-Off (their description not ours) cooking competition has

been postponed due to lack of support from within the industry. It looks like a case of canned chilli right now. Possibly the use of Koala Cook-Off, Steak Barb-In or Snag Grill-Up would have elicited more response from the local pool of culinary experts.

Wobbleboard wonder

Wobbleboard wonder Rolf Harris was introduced by dag icon Maynard F-Sharp Crabbes as being in Sydney recently to promote IBM's new version of Windows (what happened to OS/2 Warp?). Oblivious to the faux pas, Rolf nodded along in agreement, then whipped out his didgeridoo and did a stirring rendition of "Stairway To Heaven". Mr Harris was guesting at Maynard's comedy show at trendy Sydney nightclub Kinselas (frequented by Elle Macpherson and Kylie Minogue when they're in town).

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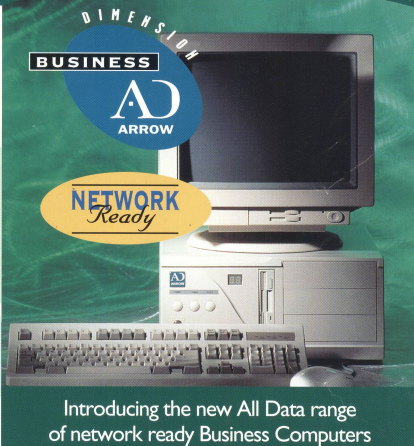
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